



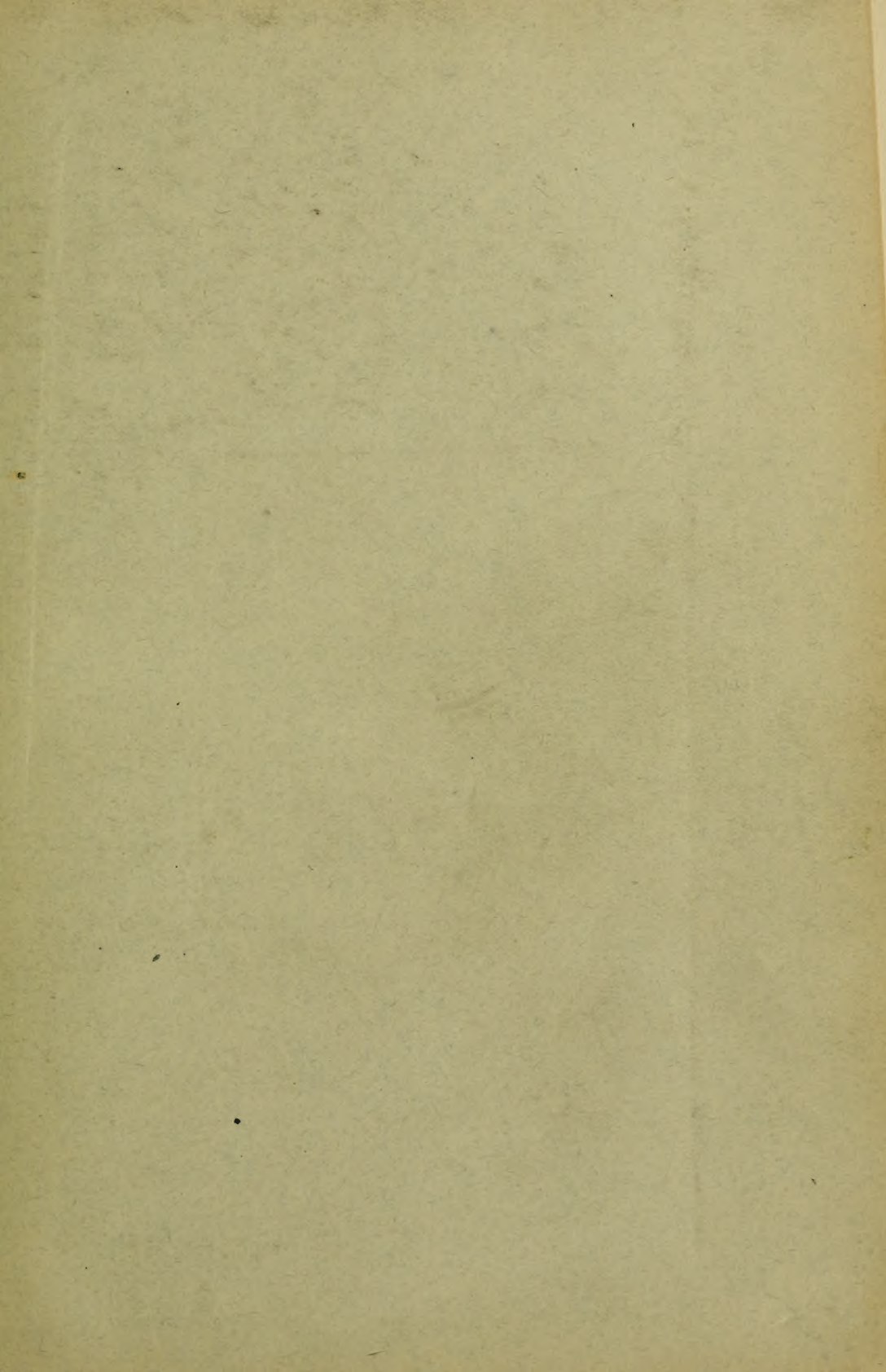


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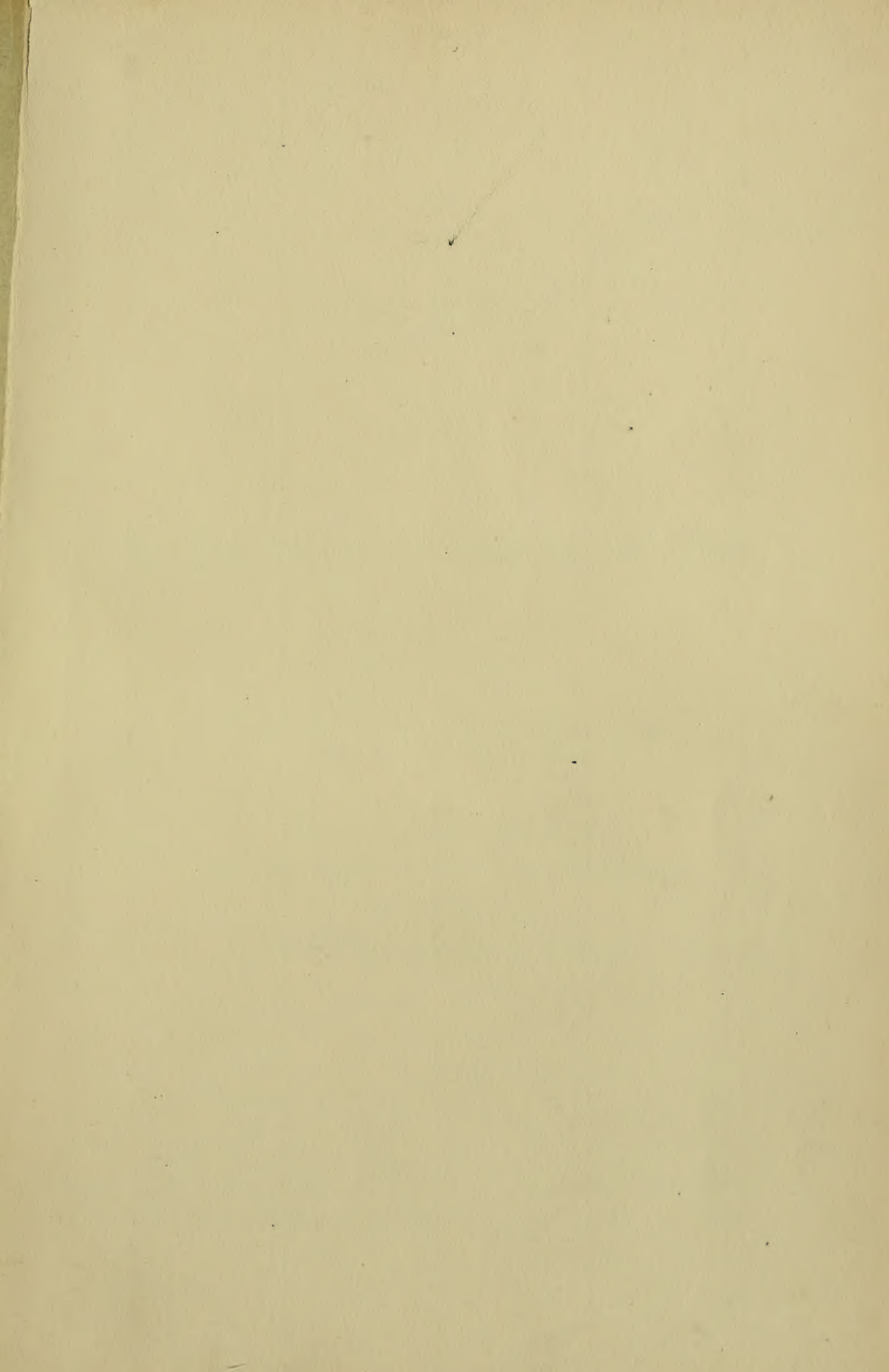


















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# JOURNAL

OF THE

Natural History Society of Siam.

## Vol. II.

Comprising Five Parts and containing Fifteen  
Plates and One Sketch Map.

Nos. 1, 3, 4 and 5 Edited by  
Malcolm Smith and W. J. F. Williamson.  
No. 2 Edited by  
Malcolm Smith and E. J. Godfrey.

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No. 1. ( Pages 1 to 76 )	...	June,	1916
No. 2. ( Pages 77 to 184 )	...	December,	1916
No. 3. ( Pages 185 to 260 )	...	May,	1917
No. 4. ( Pages 261 to 348 )	...	December,	1917
No. 5. ( Index of Species, etc. )	...	May,	1918



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MUSEUM HADIRMA  
YRABU JAHUHAN

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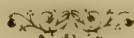
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# ADDENDA AND CORRIGENDA.

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- P. 52, line 4 from bottom, for "Smith and Kloss" read "Boettger."  
 P. 73, ,, 27, for "conjection" read "conjecture"  
 P. ,, ,, 30, for "nothern" read "northern"  
 P. ,, add as footnote, "5. Ibis, 1915, pp. 718-761."  
 P. 84, line 9, for "*maccelellandi*" read "*maclellandi*"  
 P. 92, ,, 17, for "Hypholophus" read "Hyperlophus"  
 P. 97, ,, 7, for "Hypolophus" read "Hyperlophus"  
 P. 115, ,, 5 from bottom, for "*C. coocale*" read "*C. crocale*"  
 P. 117, ,, 1, for "*H. v. hippea*" read "*P. v. hippea*"  
 P. 139, ,, 5, for "*Amblypodia*" read "*Amblypodia*"
- 

## CORRIGENDA.

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- P. 106, line 8 from bottom, for "H. H. Druce" read "H. Druce."  
 P. 158, line 6, for "only 22" read "24."  
 P. 296, last line, for "*Ursusus*" read "*Ursus*."  
  
 P. 297, ,, 1, ) near Sisophon, Cambodia.  
 ,, ,, 5 from bottom, for "Cambodian" read "Siamese"  
 P. 298, ,, 23, after "defined" insert "as"  
 P. 299, lines 7, 8, 10 and 30, for "*leucera*" read "*leucura*"  
 P. 300, line 3, for "colour" read "colours"  
 ,, ,, 10, for "condyle-basilar" read "condylo-basilar"  
 ,, ,, 20, for "Proc. Acad." read "Proc. Acad."  
 P. 313, ,, 5, for "conolor" read "concolor"  
 P. 345, p. 19, after "much" insert "what exists now as"
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,, ,, 15, for "*Αρpopala*" read "*Arhopala*"  
P. 148, ,, 7 from bottom, for "Lygosma" read "Lygosoma"  
P. 150, ,, 2, before "mm." insert "215"  
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P. 177, line 2, for "Symphisial" read "Symphysial"  
P. 181, ,, 7 from bottom, for "former" read "latter"  
P. 182, ,, 3, after "Journal" insert "I"; and for "p. 159" read  
"p. 157"  
P. 227, ,, 2, for "firt" read "first"  
P. 247, ,, 10, for "throughont" read "throughout"  
P. 248, ,, 16, for "parellel" read "parallel"  
P. 284, ,, 2, for "*malayna*" read "*malayana*"  
P. 296, ,, 18, } for "near Sisophon, S. E. Siam" read "S. E. Siam,  
P. 297, ,, 1, } near Sisophon, Cambodia."  
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Volume II.

BANGKOK.

Number 1.

ON A COLLECTION OF MAMMALS FROM SIAM.

By C. BODEN KLOSS, F.Z.S.

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I am indebted to Messrs. E. G. Herbert and Malcolm Smith for the opportunity of examining a collection of mammals made at various localities in Siam. Though these gentlemen are primarily interested in birds and reptiles, at my suggestion they have been good enough to instruct their collectors to preserve examples of such mammals as might be met with by them while in pursuit of their proper duties. The result is a small but illuminating consignment which includes several interesting specimens, amongst which are a new *Hylomys* or Lesser *Gymnura* and new races of langur and forest rat, while the discovery, just north of the Isthmus of Kra, of *Phoniscus utrov*, a genus of bat known hitherto by only two specimens from Sumatra, is also very noteworthy.

I have given descriptions of the specimens (which will not however, always serve to distinguish the races listed here from other subspecies occurring in neighbouring areas) in order that they may be recognised without consultation of the references which, with one exception, are probably not accessible to residents in Siam. Blanford's



volume in the Fauna of British India Series is likely to be available to most people interested in mammals, but it must be remembered that most of his species are "blanket" or "portmanteau" species and that the description given often covers and includes a number of forms which are regarded to-day as perfectly distinct from each other sub-specifically.

The following are the localities at which the animals were obtained:—

*In Central Siam*: Sam Kok, just south of Ayuthia; Krabin, on the Bangpakong River.

*In Eastern Siam*: Hinlap, Pak Jong, Chan Teuk, stations on the railway crossing the Dong Rek range between the towns of Saraburi and Korat.

*In South-Eastern Siam*: Hup Bon, about 12 miles E. of Sriracha.

*In Peninsular Siam*: Klong Wang Hip (Nakon Sitamarat), a stream at the foot of the hills about 8 miles to the N. E. of Tung Sawng. Khao Wang Hip, the hill near by and part of the main range, altitude about 2,500 feet. From the "Lower Camp," the country at the foot of the hill and the lower slopes of the same were worked; from the "Upper Camp," the summit and the upper slopes.

Maprit, a new station on the Southern railway, due W. of Patiyu. Klong Bang Lai, an uninhabited portion of country, 10 miles N. W. of Maprit and close to the hills.

Koh Lak, in the province of Pran.

The names of colours used are generally those of Ridgway's second publication "Colour Standards and Nomenclature," 1912.

### 1. *Macaca andamanensis*.

*Macaca andamanensis*, Bartlett, Land and Water, VIII, p. 57 (1869);

Kloss, P.Z.S., 1916, p. 30.

*Macacus leoninus*, Blyth, Cat. Mamm., Mus., Asiatic Soc., Bengal, p. 7, (1863); Selater, P.Z.S., 1870, p. 663, pl. XXXV; Anderson, Anat. and Zool. Res., p. 52, (1878); Blanford, Faun. Brit. Ind., Mamm., p. 18 (1888).

1 ♀ adult      Pak Jong, Eastern Siam, 900 ft.      Dec. 1915,  
[No. 2057].

Owing to the lack of good descriptions of the females of these monkeys it is by no means easy to settle their identity and one cannot pronounce on them with certainty unless provided with males



taken in association.

To the present example Anderson's description of a female *leominus* (= *andamanensis*), seems best to apply; and with it also agrees a female which I have recently recorded from the extreme South-east of Siam.

It is with some hesitation that I have placed these two Siamese specimens under *andamanensis*, and have done so only because descriptions of that animal, rather than of any other, seem best to apply to them. The question can only be settled by comparing them with other authentic specimens and as our knowledge of the monkeys of this group is still very indefinite and incomplete it may be some time before that can be done. It may well be that the Siam-Cambodia region possesses a race of pig-tailed macaque still to be recognised: for the type locality of *andamanensis* is Arakan or Pegu—a considerable distance away.

*Macaca adusta*,<sup>1</sup> Miller, founded on specimens from South Tenasserim, must not be overlooked when dealing with Siamese short-tailed Macaques, but no description of the female is given. It is reported however that the upper parts are without annulations (Elliot, Review of the Primates, II (1913), p. 207), but in the Pak Jong animal these are very marked.

The latter is mummy-brown annulated with buffy on crown, lumbar region, rump and forearms; and is suffused with ochraceous on nape, shoulders, upper arms and, to a less degree, on the sides; the rump is darkest but not approaching black anywhere. The legs are pale mummy-brown, unannulated; and the hairs round the ears, on sides of neck, lower surface of body and inner sides of limbs, which are all an indefinable pale buffy drab, are also unspotted. The face, indistinctly grizzled dull whitish-buff and brown, has ear-tufts and cheeks tinged with ochraceous; the lower lip and feet are mummy-brown and the tail is black above and like the buttocks below. There are a few stiff black hairs below the front edge of the sharply defined crown.

Native collector's external measurements<sup>2</sup>:— total length, 649;

---

1. Proc. U. S. Nat. Mus., xxix, p. 559, pls xiii—xvii (1906).

2. The external measurements were taken from the animals while in the flesh by a trained native collector and though there is little reason to doubt their correctness they must necessarily be accepted with some reserve.



tail, 160 ; hind foot, 154 mm.

Measurements of skull :— greatest length, 114 ; basal length, 79.5 ; zygomatic breadth, 76 ; maxillary tooth-row exclusive of incisors, 37.7 : these dimensions are almost exactly identical with those of the two females mentioned above.

## 2. *Presbytis obscura flavicauda*.

*Pygathrix flavicauda*, Elliot, Proc. U. S. Nat. Mus., XXXVIII, p. 352 (1910) ; id., Review of the Primates, III, p. 50 (1912).

*Sennopithecus obscurus*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 41 (1888).

*Presbytis obscura* subsp., Robinson and Kloss, Journ. Fed. Malay States Mus., V., p. 113 (1914).

1♀ adult, 1♂ adult, Khao Wang Hip (Lower camp), Peninsular Siam, Sept. 1915 [Nos. 2022, 2023].

To examples of *P. obscura* from Trang, in Peninsular Siam, and from South Tenasserim, Elliot gave the name *flavicauda*, but though I have examined a number of langurs from the range allotted, including paratypes and topotypes of *flavicauda*, I have seen no individual to which the distinguishing characters completely apply<sup>1</sup> : they are, however paler on hind limbs and tail than typical *obscura* and therefore the name may stand : there is a good deal of individual variation and the cream-coloured tail attributed to the type is perhaps abnormal.

The appearance of the Nakon Sritamarat specimens is as follows :—Hairs of crown growing backward and forming a flat pad, longest on the occiput. No upstanding crest.

Male: Cap on head conspicuously buffy drab grey. General colour above and on sides, brownish-black to black,<sup>2</sup> paler on the median line : underside of body paler and browner. Fore limbs at elbows hair-brown, hind-limbs and tail smoke grey. Frontal fringe, side of head, hands and feet black : lips and chin with whitish hairs. Skin of eyelids, lips and chin in life whitish to bluish pink.

The female differs considerably in having the limbs, tail and other pale areas notably washed with russet and ochraceous ; the median dorsal area and the rump paler and the cap more buffy.

The extent to which individual variation may be carried in the

1. Legs from hips pale smoke-grey, tail cream-coloured.

2. In living animals there is often a purplish tone in the pelage which it is impossible to describe exactly.



direction shown by this female is well illustrated by an abnormal male from Bandon in which the colour of the pelage ranges from café-au-lait to snuff-brown ( cf. Robinson and Kloss, *l.c.s.* ).

( For measurements see table p. 7. )

### 3. *Presbytis obscura smithi*, subsp. nov.

*Type.* Adult female ( skin and skull ) Author's No. 2080/CBK. Collected at Klong Bang Lai, Patiyu, Peninsular Siam on 21st January 1916.

*Characters.* Most resembling *P. o. javicauda*, Elliot,\* from Trang, Peninsular Siam, but tail, ears, and limbs lighter in colour, the grey of the thighs extending farther on to the rump and contrasting sharply with the black body and feet ; occipital cap less yellowish.

*Colour.* Back and sides brownish-black to black ; frontal fringe, sides of head, hands and feet, black ; lips and chin with whitish hairs, the skin of these parts and of the eyelids being pinkish-white in life.

Cap pale smoke-grey ; shoulders, and anterior median line of back hair-brown, the latter bronzed ; fore-limbs a variable hair-brown lightening to grey on the elbows and darkening on the forearm to the black of the hands ; chest pale hair-brown ; abdomen smoke-grey ; buttocks, hind-limbs and entire tail very pale silvery grey sharply contrasting with the black feet and trunk ; the inner side of the thighs neutral grey ; ears thinly clad and fringed with silvery hairs.

*Skull and Teeth.* Like those of *P. o. javicauda* but with rostrum and palate decidedly broader.

*Measurements.* External biorbital breadth, 63.5 ; orbit to gnathion, 29.0 ; breadth of rostrum above middle of pm<sup>1</sup>, 32.0 ; palatal breadth at middle of m<sup>1</sup>, 20.8 ; palatal length, 38.0. For other measurements see p. 7.

*Specimens examined.* One, the type.

*Remarks.* The intensely black feet in sharp contrast with the silvery leg and the paler limbs and cap very well differentiate this race from the more southern form. With it, however, may probably be associated the langurs from Kisseraing and Sir William James islands

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\*. *Ante* p. 4



in the Mergui Archipelago cited by Elliot who wrote of them<sup>1</sup> : "The legs are even paler than those of the type (of *P. o. flavicauda*), hands and feet jet black, strongly contrasted with the arms and legs, and the skulls have a flatter brain case and broader rostrum." The rostral breadth in the present animal is 32 mm. while the same measurement in similarly adult males from Trang and Perlis varies from 30 to 28 : the flattening of the occiput mentioned is probably merely due to age.

One does not normally expect to find skull differences between the subspecies of a langur, and the Patiyu form can, if necessary, be ranked as a local race on colour features alone. I have named it in honour of Dr. Malcolm Smith in recognition of the part he has taken in bringing together the present collection and also of the active interest he takes in the general zoology of Siam.

#### 4. *Presbytis neglecta keatii*.

*Presbytis neglecta keatii*, Robinson and Kloss, Journ. Fed. Malay States Mus., IV, p. 174 (1911); id., op. cit., V, p. 111 (1914); Wroughton, Journ. Bombay Nat. Hist. Soc. XXIII, p. 701 (1915).  
*Semnopithecus femoralis*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 42 (1882).

1 ♀ adult, Khao Wang Hip (Upper camp), Peninsular Siam, Sept. 1915 [No. 2029].

A median vertical crest and an upstanding occipito-nuchal pad.

General colour clear blackish-brown to clove-brown. Frontal fringe, temporal tufts, sides of head and neck, hands and feet extending some distance up the backs of the limbs, tip of tail, black. The inner side of the thighs broadly, of the lower leg narrowly, white (this colour generally extends on to the lower part of the abdomen and is sometimes found occurring on the inner side of the upper arm).

The range of this langur which inhabits Peninsular Siam is not fully known but it has been obtained as far south as Taiping, Perak and north as far as the Isthmus of Kra.

(For measurements see table p. 7.)

1. Proc. U. S. Nat. Mus., vol. 38, p. 352 (1910).



## Measurements of Siamese Langurs in Millimetres.

		P. obscura flavicauda, Female, 2022.	P. obscura flavicauda, Female, 2023.	P. obscura smithi, Male, 2028.	P. neglecta keatii, Female, 2029.
Collector's external measurements :—					
Head and body	... ..	460	491	562	546
Tail	... ..	774	698	783	706
Hind foot	... ..	156	149	167	168
Skull :—					
Greatest length	... ..	90.0	98.3	100.0	93.0
Basal length	... ..	65.5	69.0	73.0	62.0
Zygomatic breadth...	... ..	71.0	74.0	78.0	70.4
Maxillary tooth row exclusive of incisors }	... ..	31.0	33.0	35.0	29.3

5. *Paguma leucomystax robustus*.

*Paradocurus robustus*, Miller, Proc. Biol. Soc. Washington, XIX, p.26 (1906).

*Paguma leucomystax robustus*, Robinson and Kloss, Journ. Fed. Malay States, Mus., V, p.113 (1915). Wroughton, Journ. Bombay Nat. Hist. Soc. XXIII, p.710 (1915).

1 ♂ adult, 1 ♀ juv. Klong Wang Hip, Tung Sawng, Peninsular Siam. Oct. 1915. [Nos. 2031, 2032].

This palm-civet inhabits Peninsular Siam but has not been recorded north of the Isthmus of Kra.

Above it is pale buff annulated with blackish, the woolly hair-brown under-fur very visible and the median dorsal region and rump strongly suffused with ochraceous. The greater part of the lower surface is pale buffy and there are large buffy areas on the head. The sides of the muzzle to the eyes and the distal part of the tail are dark brown ; the toes are blackish.

Dimensions of the adult male :—Native collector's external measurements : head and body, 697 ; tail, 573 ; hind foot, 107. Skull : greatest length, 127 ; basal length, 119 ; zygomatic breadth, 74 ; maxillary tooth row exclusive of incisors, 43.8.



### 6. *Arctonyx dictator*.

*Arctonyx dictator*, Thomas, Ann. and Mag. Nat. Hist., Ser. 8, V, p. 424 (1910).

*Arctonyx collaris*, Blanford (partim), Faun. Brit. Ind., Mamm. p. 179 (1888); Kloss, Journ. Straits Branch Roy. Asiat. Soc. No. 53, p. 52 (1909); Gairdner, Journ. Nat. Hist. Soc. Siam I, p. 253 (1915).

1 ♂ juv. Klong Wang Hip, Tung Sawng, Peninsular Siam.

Oct. 1915. [No. 2034].

This is a young example, still retaining in part its milk dentition, of the largest of Asiatic badgers hitherto only known by three examples from Trang, Peninsular Siam (the type locality), and one from Si-sa-wat, Western Siam. The species is reported to occur in Upper Perak but its northern limit, where it meets the smaller form *A. collaris*, is unknown.

In this young example the top of the muzzle to beyond the crown, the upper edges of the ears, an elongate patch beneath the eye, chin, throat and fore-chest, sides of the neck to shoulders and the tail are buffy-white. The rest of the long coarse pelage is black, slightly tipped in places with buffy on the head and shoulders and thence gradually changing to buffy annulated with black posteriorly.

The dimensions of the type, an old female, are as follows:—head and body, 1025; tail, 235; hindfoot, 122. Skull: condylo-basal length, 166; greatest breadth, 99.

### 7. *Tupaia glis wilkinsoni*.

*Tupaia ferruginea wilkinsoni*, Robinson and Kloss, Journ. Fed. Malay States Mus., IV, p. 173 (1911).

*Tupaia glis wilkinsoni*, id., op. cit., V, p. 113 (1911).

*Tupaia ferruginea*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 210 (1888).

1 ♂ adult. Khao Wang Hip, (Lower Camp), Peninsular Siam.

Sept 1915. [No. 2024].

This specimen of Tree-shrew agrees with others from Bandon which, as I have elsewhere pointed out (*op. cit.*, *supra*. p. 113), are much more ferruginous on the shoulders than typical *wilkinsoni* from Trang: at the same time they do not approach, in intensity of colour, the Southern race *ferruginea*.

Above, a speckle of black and ochraceous suffused posteriorly with ferruginous: a buff stripe from the neck to the shoulder. Under surface buff, deepest on the median line. Tail annulated black and buffy.



This race inhabits Peninsular Siam: in the rest of that country other species are met with. For measurements see below.

### 8. *Tupaia belangeri*.

*Cladobates belangeri*, Wagner, Schreb. Saugth., Suppl., II, p. 42 (1841).

*Tupaia pygmaea*, Lesson, Nouv. Tabl. Reg. Anim. Mamm., p. 93 (1842).

*Tupaia belangeri*, Andersen, Anat. Res., 1878, p. 126, pl. 7, figs. 6 and 7; Lyon, Proc. U. S. Nat. Mus., 45, p. 59, pl. 8, fig. 2 (1913); Gyldenstolpe Arkiv för Zoologi, Stockholm, 8, No. 23 p. 9 (1914); Wroughton, Journ. Bombay Nat. Hist. Soc. XXIII p. 707 (1915).

*Tupaia ferruginea*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 210 (1888).

1 ♂ adult 1 ♀ adult. Maprit, Patiyyu, Peninsular Siam. Jan. 1915. [Nos. 2075, 2077].

This species differs from the last in having three pairs of mammae instead of two pairs only; in rather smaller size; relatively shorter skull, the length between the tip of the premaxillaries and the lachrymal notch in particular being less; and in paler, duller colouration, lacking the rich ferruginous wash on the posterior part of the body where it is replaced by an ochraceous tinge, while the tail is nearly the same colour as the back.

*T. belangeri belangeri*, ranges over Western and Central Siam and is found also in Tenasserim, Pegu and Arakan. In Northern Siam *T. b. laotum*, Thomas, occurs while another species *T. concolor*, Bonhote, inhabits the South-East. For measurements see below.

Measurement of Siamese Tree-shrews in Millimetres.				T. glis wil- kinsoni, Male, 2024.	T. belan- geri, Male, 2075.	T. belan- geri, Female, 2077.
Collector's external measurements						
Head and body	...	...	...	176	187	185
Tail	...	...	...	169	176	187
Hind-foot	...	...	...	44	41	42
Skull:—						
Greatest length	...	...	...	53.2	49.3	50.5
Basal length	...	...	...	46.0	43.2	44.0
Palatal length	...	...	...	28.8	26.9	26.2
Tip of premaxillaries to lachry- mal notch	...	...	...	23.0	20.2	19.6
Upper molar row	...	...	...	16.2	15.0	15.6
Inter-orbital breadth	...	...	...	15.0	15.0	13.1
Zygomatic breadth	...	...	...	25.3	26.6	24.3



9. *Hylomys siamensis*, sp. nov.

*Type.* Immature female (skin and skull), Author's No. 2065, CBK. Collected at Hinlap, Eastern Siam, 900ft, on 7th December 1915.

*Characters.* Differs from *H. suillus*, Müller and Schlegel, in having paler, more buffy coloration, and rather narrower nasals.

*Colour.* Above a speckle of black and buff slightly tinged with ochraceous on the head and rump, the hairs with neutral grey bases. Below silvery tinged with buff. Hind feet blackish, partly clad with short buffy hairs. Tail bicolored and clothed with hairs only visible through a lens.

*Skull and Teeth.* The skull does not appear to differ from skulls of *H. suillus* from the Malay Peninsula except in rather narrower nasals. Several milk teeth are still present.

*Measurements.* Native collector's external measurements:—head and body, 112 (121)\*; tail, 22 (15); hind foot, 21 (23). Skull:—greatest length, 32 (32); basal length, 28.2 (27.6); palatal length, 17 (16); upper tooth row, 16.8 (16); p<sup>3</sup>—m<sup>3</sup> 8 (8); zygomatic breadth, (16.9); length of mandible 23 (22.9).

*Specimens examined.* One, the type,

*Remarks.* I would not venture to separate the Siamese animal on an immature individual were it not that there are fortunately available for comparison several immature specimens of the older species from the Malay Peninsula. Three of them are younger and one (judged by the state of the dentition) is practically of the same age as the present animal. They exactly agree in colour with adults from the same region which, in turn, I am unable to distinguish from topotypes from Sumatra: in all of these the upper surface is mingled ferruginous and black, the hairs having plumbeous black bases: the underparts are darkish grey generally strongly suffused with buffy.

It may be fairly assumed from the above that the colour of *Hylomys* does not differ with age and therefore the present specimen may be taken as representative of the local animal.

The type of *H. pequensis*, Blyth, from Shwegyin, Lower Burma, has been available for examination. It is now quite impossible to draw any

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\* Measurements in parentheses those of an immature female of *H. suillus* from Kedah Peak, Malay States; F.M.S. Mus. No. 961/16.



conclusions from its colour as dried from spirit, but Blyth stated that the only difference between it and *H. suillus* lay in its rather longer tail. Certainly no differences in the skulls are ascertainable and the tail in *H. suillus*, though short, is very variable. Anderson's specimen from the Khayyen Hills was described as rusty brown above, the hairs with black tips, and this ranks it also with *H. suillus* from which the Siamese specimen is instantly separable by its markedly paler colour.

### 10. *Pteropus vampyrus intermedius*.

*Pteropus intermedius*, Andersen, Ann. and Mag. Nat. Hist., Ser. 8, II, p. 368 (1908); id., Cat. Chiroptera Brit. Mus., 1912, p. 341.

*Pteropus medius*, Blanford (partim) ? Faun. Brit. Ind., Mamm., p. 256 (1891).

1 ♀ subadult. Krabin, Central Siam. Nov. 1915. [No. 2041].

This species of fruit-bat has not yet been recorded from Siam proper and as the present example appears to differ somewhat from the type, which came from Moulmein and was the only specimen available for description, I append a full account of it here.

Back seal-brown plentifully sprinkled with grey-white hairs and washed with ferruginous on the rump and interfemoral membrane. Breast and belly with underside of forearm and membranes black, slightly sprinkled with dull whitish hairs; the anal region tipped ferruginous and the flanks and membranes tinged with seal-brown.

Mantle Mars-yellow gradually deepening through fulvous on the sides of the neck to bay beneath where this colour occupies a depth of about 55 mm., in strong contrast to the throat and breast. Hairs of the mantle and sides of neck with narrow blackish bases. Crown mingled black and fulvous. Muzzle including eyes, cheeks, chin and throat black.

Native collector's measurements taken in the flesh :— head and body, 281; hind foot, 51; ear, 42. Other external measurements :— Forearm, 170; Pollex :—total length, c.u., 76; metacarpal, 17.8; 1st phalanx, 40.

2nd digit :—metacarpal, 84.5; 1st phalanx, 22; 2nd—3rd phalanx, c.u., 21.5.

3rd digit :—metacarpal, 114; 1st phalanx, 85; 2nd phalanx, 127.

4th digit :—metacarpal, 110; 1st phalanx, 71; 2nd phalanx, 68.5.



5th digit:—metacarpal, 115.5; 1st phalanx, 57.6; 2nd phalanx, 56.

Depth of interfemoral in centre, 13\*. Lower leg, 83. Foot, c. u., 54\*. Calcar, 28.5\* Ear, 35\*.

Skull:—total length to gnathion, 68.7; palation to incisive foramina, 34; front of orbit to tip of nasals, 23.8; width of brain case at zygomata, 27.5; zygomatic width, 35; width across  $m^1$  externally, 17.2; lachrymal width, 12; width across canines externally, 12.1; postorbital constriction 11.3; interorbital constriction, 10.3, width of mesepterygoid fossa, 8.5; width between  $p^+$ — $p^+$  internally, 12.1; breadth between cingula of canines, 6.5; orbital diameter, 14.8; length of mandible, 53.2; coronoid height 14.8.

Upper teeth,  $c-m^2$ , 26.4. Lower teeth,  $c-m^3$ , 29.7. Upper incisors, combined width, 6.7.  $p^3$ ,  $5.1 \times 3.7$ ;  $p^4$ ,  $4.8 \times 4$ ;  $m^1$ ,  $6.1 \times 3.8$ ;  $m^2$ ,  $3.3 \times 2.5$ .  $p_1$ ,  $2.6 \times 2.3$ ;  $p_3$ ,  $5 \times 3$ ;  $p_4$ ,  $5 \times 3.3$ ;  $m_1$ ,  $5.4 \times 3.8$ ;  $m_2$ ,  $4.5 \times 3.1$ ;  $m_3$ ,  $2.5 \times 2$ .

Two other flying-foxes occur in Siam; *P. lylei* which is considerably smaller than *P. vampyrus intermedius*, and *P. vampyrus maluccensis*, which is markedly larger; the latter is only known locally from the extremities of Peninsular and South Eastern Siam.

### 11. *Phoniscus atrox*.

*Phoniscus atrox*, Miller, Proc. Biol. Soc. Washington, XVIII, p. 229 (1905); id., The Families and Genera of Bats, U. S. Nat. Mus., Bull. 57, p. 233 (1907).

1 ♂ adult, 1 ♀ adult, in alcohol. Klong Bang Lai, Patiyu, Peninsular Siam. Jan. 1916. [Nos. 2089, 2090].

The discovery of this bat in Siam is an occurrence of much interest, for the genus and species have rested hitherto on two unique females which were obtained by Dr. W. L. Abbott in an abandoned bird's nest on the banks of the Kateman River, Western Sumatra, in September 1903. I am now able to describe the male, previously unknown, and of rather brighter colour than the female.

*Ears*: Laid forward reach only to the upper incisor. Inner margin markedly convex. Outer margin straight for about 3 mm. below the rounded tip, then, where the ear bends sharply forward,

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\* Approximate measurements from dried skin.



comes an emargination followed for about 5 mm. by another convexity when a second shallow emargination occurs, between which point and its junction with the cheek the border of the ear is markedly convex and projects forward from the base.

*Tragus.* White, long and tapering to a point (length on the inner side 7 mm.): inner edge slightly convex, outer edge concave and broadening towards the base near which there is a deep sharply-defined emargination but no projection.

*Membranes.* Dark brown, unicoloured, naked. Wings, from the base of toes.

*Fur.* Long and soft. Colour from specimens dried from spirit:—male: hairs fuscous at base, then wood-brown followed by a dark brown subterminal annulation, the tips being ochraceous. The latter colour is most distinct on the extremity of the rump and on the head where the top of the muzzle and the area between the ears are markedly golden. Muzzle, except on the median line, and chin naked.

Thumbs, feet, edge of wing along the second to the end of the middle finger; the dorsal side of the forearm, femur near the knee, lower tibia, ankles, calcanea and tail, thinly but conspicuously clad with shining ochraceous hairs.

The female has the body pelage duller and darker than the male, the wood-brown being replaced by dirty whitish, while the ochraceous tips on the trunk are perhaps less pronounced and numerous.

The characters of the skull and teeth appear to exactly agree with those of the type, the cranium being higher in the middle than at the occipital region, the rostrum broad and heavy; the upper canine is very large and deeply grooved on the outer side with a posterior cutting edge, and the lower lip is pitted to receive it; the inner lower incisors are four-cusped.

*Measurements.* External dimensions from spirit specimens:—Head and body, 40 (42.5)\*; tail, 40 (38); tibia, 14.2 (15.2); forearm, 32.3 (32.6); 2nd finger, 33 (30.5); 3rd finger, 33.2 + 15.0 + 18.5 = 66.7 (33.0 + 14.4 + 19.7 = 67.1); 4th finger, 32.0 + 11.0 + 9.0 = 52.0 (31.3 + 11.0 + 9.5 = 51.8); 5th finger, 30.5 + 9.2 + 7.5 = 47.2 (29.5 + 8.8 + 8.0 = 46.3). Skull of male example:

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\* Measurements in parentheses those of the female.



greatest length, 15.5; occipito-sinual length, 13.5; basi-sinual length, 11.1; palatal length, 7.9; greatest rostral breadth, 4.7; cranial breadth, 8.0; zygomatic breadth, 9.5; maxillary tooth row exclusive of incisors, 6.1;  $m^2-m^2$  externally, 5.6;  $c-c$  externally, 3.8; lower mandible, 10.9 mm.

Though direct comparison of specimens may elicit some differences, the continental animals appear to agree completely with the description of the Sumatran individuals. There is a slight divergence in size in favour of the latter but when we have more examples from the type region this may prove to be well within the limits of local variation.

## 12. *Rhinolophus trifolius*.

*Rhinolophus trifolius*, Temm. Mon. Mamm., p.27, pl. XXXI (1835);  
Blanford, Faun. Brit. Ind., Mamm., p.272 (1891).

2 ♂ adults in alcohol. Khao Wang Hip (Lower camp), Peninsular Siam. Oct. 1915 [No. 2086, 2087.]

Forearm 52 millimetres.

## 13. *Petaurista petaurista cicur*.

*Petaurista nitida cicur*, Robinson and Kloss, Ann. and Mag. Nat. Hist., Ser. 8, XIII, p.224 (1914); id., Journ. Fed. Malay States Mus. V, p.117 (1914).

1 ♂ adult. Klong Wang Hip, Tung Sawng, Peninsular Siam, Oct. 1915. [No.2035].

This handsome flying-squirrel is rich chestnut above, all the hairs having black tips except on the head which is largely ochraceous. The nose, whisker patches, a ring round the eye, inner side of ears, metectote, hands, feet and the tip of the tail are black, as are the edge of the antebrachial and interfemoral membranes and the parachute near the extremities. The undersurface of the body and the distal half of the tail are ochraceous orange.

Collector's external measurements:—head and body, 434; tail, 582; hind foot, 79 mm.

Skull: greatest length, 70.2; condylo-basilar length, 62; palatal length, 31.6; diastema, 15; upper tooth row, 15.8; greatest length of nasals, 22.5; greatest breadth of nasals, 12.3; interorbital breadth, 15.2; width between tips of postorbital processes, 35.3; zygomatic breadth, 45.3 mm.



14. *Ratufa melanopepla leucogenys*.

*Ratufa melanopepla leucogenys*, Kloss, P.Z.S., 1916, p. 43.

*Sciurus bicolor*, Blandford (partim), Faun. Brit. Ind., Mamm., p.373 (1891).

*Ratufa melanopepla*, Gyldenstolpe, Arkiv för Zoologi, Stockholm, 8, No. 23, p.15 (1914).

1 ♀ adult, Krabin, Central Siam. Nov. 1915 [No. 2050].

1 ♂ adult, Hinlap, Eastern Siam, 900ft. Dec. 1915 [No. 2066].

One of these is without the patches of buff hair on the hind feet which occurs in all the other specimens I have examined.

Upper surface and entire tail, brownish black, the hairs with glistening black tips; a russet patch on the nape. Undersurface, pale orange-yellow, chin, black. Cheeks, sides of neck, upper side of forelimbs in part, and generally a patch on the top of the hind-feet, creamy.

Native collector's external measurements \*:—head and body, 383, 411; tail, 469, 482; hind foot, 79, 83 mm.

Skull: greatest length, 73, 73; condylo-basilar length, 61.3 61.2; palatilar length, 28, 27; diastema, 14.3, 14.7; greatest length of nasals, 23.3, 26; greatest breadth of nasals, 14, 14; interorbital breadth, 28, 28.7; zygomatic breadth, 45.2, 45.1 mm.

15. *Ratufa pyrrsonota*.

*Ratufa pyrrsonota*, Miller, Proc. Biol. Soc. Washington, II, p. 75, (1900).

1 ♂ aged. Khao Wang Hip (Upper camp), Peninsular Siam. Sept. 1915. [No. 2030].

This speckled giant-squirrel inhabits Peninsular Siam, but extends as far south as Taiping, Perak: to the north I have seen it near Victoria Point, Tenasserim, but obtained no specimens, nor is it included in the list of mammals collected there by Mr. G. C. Shortridge (Wroughton, Journ. Bombay Nat. Hist. Soc., XXIII, p. 695).

The general colour above is a fine speckle of ochraceous and dark brown, more tawny but less speckled on the limbs: the under-

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\* The measurements are those of the female and male respectively.



surface is clear ochraceous. Top of muzzle, dark brown, sides of muzzle, whitish, cheeks and chin, grizzled dark brown. Tail, dark brown, the bases of the hairs buffy; the latter colour most conspicuous on the under side, where the short hairs clothing the caudal bones are dark brown. There is a large buffy-white patch on the outer side of the thighs.

Native collector's external measurements:—head and body, 358; tail, 399; hind-foot, 71 mm.

Skull:—Greatest length, 64.2; condylo-basilar length, 55.3; palatilar length, 25; diastema, 14; upper molar row, 12.7; greatest length of nasals, 21; greatest breadth of nasals, 12; least inter-orbital breadth, 25.2; zygomatic breadth, 40 mm.

### 16. *Sciurus finlaysoni*.

*Sciurus finlaysoni*, Horsfield, Zool. Res. Java, 1824; Anderson, Anat. and Zool. Res., 1878, p.244; Flower (partim) P.Z.S., 1900, p.355; Bonhote (partim) P.Z.S., 1901, pt. 1, p.53; Wroughton (partim) Ann. and Mag. Nat., Hist., Ser. 8, II, pp. 394, 396 (1908); Gyldenstolpe (partim), Arkiv for Zoologi, Stockholm, vol. 8, No. 23, p.11 (1914); Kloss, Journ. Nat. Hist. Soc. Siam, I, pp 157, 225 (1915).

1 ♀ subadult, Chan Teuk, Eastern Siam. Aug. 1915.

3 ♂, 2 ♀ adults, Krabin, Central Siam. Nov. 1915. [Nos. 2020, 2037, 2038, 2046, 2047, 2048].

I have already contributed some notes on the "white" squirrel of Siam to this Journal, but this well-preserved series furnishes opportunity for a few additional details.

Each animal ranges in colour from white to cream, and in several the rump and the greater part of the tail is a warm buff, while some have patches of similar colour on the hands and feet. The whiskers are black or white or a mixture of the two, and wherever the skin is exposed or only thinly clad with hair, as on the ears, sides of face, and undersides of limbs, it is black or blackish.

That the difference between this, the mainland race, *S. f. finlaysoni*, and *S. f. portus, mihi*, of Koh Si Chang is only one of size is fully confirmed by this series, which bears out my suggestion that mainland animals would run considerably larger than examples already recorded.

(For measurements see table p. 30).



17. *Sciurus nox*.

*Sciurus nox*, Wroughton, Ann. and Mag. Nat. Hist. Ser. 8, II, p. 396 (1908); Gyldenstolpe, Arkiv för Zoologi, vol. 8, No. 23, p. 13 (1914).

1♂, 1♀ adult, Hup Bon, South-east Siam. July 1915. [Nos. 2014, 2016].

We want more information as to the range of this entirely coal-black squirrel which is yet only known from the neighbourhood of Sriracha.

(For measurements see table p. 30).

18. *Sciurus bocourti bocourti*.

*Sciurus bocourti*, M-Edw., Rev. Zool., p. 193 (1867); Anderson, Anat. and Zool. Res., 1878, p. 244; Wroughton, Ann. and Mag. Nat. Hist., Ser. 8, II, p. 395, 399, (1908); Kloss, Journ. Nat. Hist. Soc. Siam, I, p. 227 (1915).

*Sciurus leucogaster*, M-Edw., op. cit., p. 196; Anderson, op. cit., p. 245. *Sciurus finlaysoni*, Thomas, P.Z.S. 1898, p. 245; Flower (partim), P.Z.S., 1900, p. 355.

*Sciurus leucocephalus*, Bonhote, P.Z.S. 1901, pt. I, p. 54.

*Sciurus floweri*, Bonhote, Ann and Mag. Nat. Hist., Ser. 7, VII, p. 455 (1901); Kloss, tom. cit., p. 228.

1♂ adult, Sam Kok, Central Siam. June 1915. [No. 2013].

Just as Anderson in 1878 regarded nearly all Siamese squirrels as varieties of *Sc. ferrugineus*, so to-day we include under *S. b. bocourti*, no doubt more correctly, a number of animals of varied appearance inhabiting Central Siam, all of which we regard as aberrations of that race.

Wroughton has defined three subspecies from more northern areas, but at present the southern animals are all considered to be members of the very changeable typical race.

In colour the present specimen is grizzled black and warm buff above, the latter colour deepening to ochraceous on the nape and head. The undersurface is white, this colour spreading over the muzzle and thence projecting backwards to surround the eyes, and also extending over much of the upper sides of the hands and feet: excepting the throat and forelimbs, it is thickly sprinkled with chestnut hairs, which suggest that the lower parts are in a state of change between that colour and white. The ears are partly white and partly ochraceous.



The basal two-thirds of the tail is like the back but much more coarsely annulated, the terminal third is annulated black and chestnut with the base of the hairs black and ochraceous<sup>1</sup>.

*S. floweri* has the same type of colouration as *S. bocourti*, and the measurements so closely agree with those of the present specimen (and with Wroughton's dimensions for *bocourti*), except in the matter of greatest length of skull alone, that I now think the figure given (44 mm.) is probably a misprint and therefore have placed Bonhote's name amongst other synonyms of the typical race.

(For measurements see table p. 30).

### 19. *Sciurus erythræus rubeculus*.

*Sciurus rubeculus*, Miller, Smithsonian Miscellaneous Collections, vol. 45, p. 22 (1903).

*Sciurus erythræus*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 377 (1891); Flower, P.Z.S., 1900, p. 356.

*Sciurus erythræus rubeculus*, Robinson and Kloss, Journ. Fed. Malay States Mus., V., p. 118 (1914).

1 ♀ adult, Khao Wang Hip (Upper camp), Peninsular Siam. Sept. 1915. [No. 2026].

This squirrel is a member of a group or species of which a number of forms have been distinguished from the Indo-Chinese sub-region.

Colour above, and including entire tail which is coarsely annulated, a grizzle of black and ochraceous, the latter colour being in excess on the head and ears while the terminal half of the tail is suffused with golden orange. Below, the grizzled area is duller; and extending between the fore and hind limbs, divided by a median grizzled line, are two broad stripes of mahogany red; but the extent of the latter colour is very variable in animals from the same locality.

(For measurements see table p. 31).

### 20. *Sciurus caniceps*.

*Sciurus caniceps*, Gray, Ann. and Mag. Nat. Hist., X, p. 236 (1842);

Thomas, P.Z.S., 1886, p. 68; Bonhote P.Z.S., 1900, p. 195; id. op. cit. 1901, pt 1, p. 55; id. op. cit., 1902, pt 1, p. 39; Gyldenstolpe, Arkiv. för Zoologi, Stockholm, vol. 8, No. 23, p. 10 (1914); Blanford (partim), Faun. Brit. Ind., Mamm. p. 380 (1891).

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<sup>1</sup> *S. bocourti* as represented by this example is not, as I conjectured elsewhere, a possible phase of *S. finlaysoni*, but quite a distinct species.



*Sciurus chrysonotus*, Blyth, Journ. Asiat. Soc. Bengal, XVI, p.873, pl. XXXVII, fig 1 (1847); Peters, P.Z.S., 1866, p. 429.

2 ♀ adults, 1 ♀ juv., Krabin, Central Siam. Nov. 1915. [Nos. 2043, 2044, 2049].

This squirrel, which in its summer pelage somewhat resembles races of *S. concolor* from Peninsular Siam, is represented in this collection by individuals in slightly varying stages of the very striking winter coat.

The whole of the upper surface is rich Mars yellow, the hairs slightly tipped with black except on the limbs, muzzle and ears. The yellow extends some distance down the base of the tail and less strongly over the head and sides of the neck. The limbs are grizzled black and white, muzzle and fore-feet are greyish white and the hind-feet silvery white. The undersurface varies from whitish to pale grey, and there is a median stripe of yellowish grey. The tail is coarsely banded black and white with a sharply defined pure black tip.

The young animal is rather interesting, for though it retains in part its milk dentition, it yet possesses the winter pelage though not quite to the same complete degree as do the adults.

The winter coat first shows about the end of September as yellow patches on the back; while the summer pelage commences about March with grey patches in the golden area until a coat of uniform grizzled grey, lighter on the under parts, top of head and feet, is arrived at.

These squirrels are Blyth's *S. chrysonotus* of Tenasserim, with the types of which I have compared them, and though Gray's *S. caniceps* was said to have come from Bhutan (where no such squirrel occurs), there is no doubt but that the name should apply to these animals and, being the oldest, must therefore be used.

I would venture the suggestion (though I have not seen them) that the squirrels from North Siam described by Robinson and Wroughton (Journ. Fed. Malay States Mus., IV (1911), p.233) under the name of *S. epomophorus fluminialis* are individuals of this species in dull summer pelage.

(For measurements see table p. 30).



21. *Sciurus concolor milleri*.

*Sciurus epomophorus milleri*, Robinson and Wroughton, Journ. Fed. Malay States Mus., IV, p. 233 (1911).

*Sciurus concolor milleri*, Robinson and Kloss, op. cit. supra, V, p. 118 (1914).

*Sciurus caniceps*, var. 2, Blanford (partim), Faun. Brit. Ind., Mamm., p. 380 (1891).

1 ♀ adult. Klong Wang Hip, Tung Sawng, Peninsular Siam. Oct. 1915. [No. 2033].

This race is one of those into which *S. concolor* of the Malay Peninsula has been split. In true *S. concolor*, occurring south of about Sungkla, there are no yellowish neck and flank patches, and the black tip of the tail is not sharply defined, while, if an ochraceous suffusion is present on the back, it is strongest on the rump.

In the Tenasserim and Siamese races, *S. c. davisoni* from South Tenasserim and *S. c. milleri* from Trang, both the former features are present but the last, if it occurs, is either general or deepest on the shoulders. Animals from these localities vary very much among themselves and it is possible that there is very little marked difference between the two races.

The present example has the head and limbs grizzled grey, the remainder of the body above being a speckle of black and ochraceous-buff. The sides of the neck, and the flanks extending below to the inguinal region, are ochraceous-orange; the rest of the under parts being neutral grey. The tail is coarsely annulated buff and black, the hairs having whitish tips towards the extremity which is clear black, sharply defined.

The various grey squirrels from the Malay Peninsula and its islands which do not have a change to a definite form of winter pelage should all, I think, be regarded as races of *S. concolor*. In summer coat *caniceps* and *concolor* are very similar, but the latter is somewhat the smaller of the two.

(For measurements see table p. 30).

22. *Sciurus vittatus miniatus*.

*Sciurus notatus miniatus*, Miller, Proc. Acad. Nat. Sci., Washington, II, p. 79 (1900).

*Sciurus notatus*, Bonhote (partim), P. Z. S. 1900, p. 879.



*Sciurus vittatus*, Bonhote, Fasciculi Malayenses, Zool., Pt. 1, p.22 (1903.)

*Sciurus vittatus miniatus*, Robinson and Kloss, Journ. Fed. Malay States Mus., V, p.115 (1914).

1 ♂ adult. Khao Wang Hip (Lower camp), Peninsular Siam. Sept. 1915. [No. 2025.]

This is a Malayan species of squirrel which in Tung Sawng nearly reaches its northern limit. Its appearance may be shortly described as a grizzle of black and buff above, with the under-surface, except on the chin, nearly "burnt sienna". Separating these two colours on either side are broad stripes of buff and black. The tail is like the back, but the annulations are much coarser and the tip and the distal half of the under side are fulvous like the belly.

(For measurements see table p. 31).

### 23. *Sciurus tenuis surdus*.

*Sciurus tenuis surdus*, Miller, Proc. Acad. Nat. Sci., Washington, II, p.80 (1900); Bonhote, Fasciculi Malayenses, Zool., Pt. 1, p.21 (1903).

Robinson and Kloss, Journ. Fed. Malay States Mus., V, p.119 (1914), *Sciurus tenuis*, Bonhote, P. Z. S., 1900, p. 878.

1 ♂ adult. Khao Wang Hip (Lower camp), Peninsular Siam; Sept. 1915. [No. 2021].

A Malayan species not extending much further north.

Above, a grizzle of black and buff, tinged with ochraceous on head, shoulders and thighs: the under surface grey tinged with buff and not sharply separated from the colour of the sides: tail coarsely annulated, the hairs with whitish tips.

A second race of *S. tenuis* (*S. t. gunong*, Robinson and Kloss, loc. cit. supra) inhabits the mountains of Bandon and doubtless other hill ranges of Peninsular Siam: it differs from *S. t. surdus* in larger size, darker upper parts and more buffy under side.

(For measurements see table p. 31).

### 24. *Tamiops rodolphi*.

*Sciurus rodolphi*, Milne-Edwards, Rev. and Mag. de Zool. XIX, p. 227 (1867).

*Tamiops rodolphi*, Kloss, P.Z.S. 1916, p. 47.

1 ♂ adult. Krabin, Central Siam. Nov. 1915. [No. 2040].

This species was described from Cochin-China and I have recently recorded it from the vicinity of Krat, S. E. Siam, where its



presence was not unexpected, but it is something of a surprise to find that it extends as far as Krabin and western examples should be compared with topotypes.

The general upper colour of this specimen is buffy-grey, the hairs having grey bases and very pale buff tips. There are four buffy stripes on the back, the outer pair, which are slightly paler than the inner, extending from the base of the tail to the ears and thence less distinctly to the muzzle; the inner pair, richer in tint, only just reaching the shoulders. The areas between the buff stripes are grizzled black and ochraceous, darkest posteriorly, while anteriorly the ochraceous tone is continued to the crown: the median dorsal line is the blackest of the three. The under-parts are buff-yellow. The tail is coarsely annulated ochraceous and black, the hairs with whitish terminations, but the tip of the tail is nearly entirely black. Upper side of ears black, their tips with long tufts of hair which are white to their bases.

(For measurements see table p. 31).

The other species of *Tamias* occurring in Siam is *T. barbei*, first known from Ye on the Tenasserim Coast, of which one race *T. b. kongensis* (Bonhote) has been met with from Raheng northwards while a second, *T. b. novemlineatus* (Miller), occupies the Malay Peninsula. Perhaps the most marked difference between the two species is that while in *rodolphi* the median stripe is distinctly the blackest of the three dark dorsal stripes, in *barbei* all three are about equally black. It would be interesting to know where the two species meet and whether the lower course of the Menam forms the boundary between their ranges.

## 25. *Lariscus insignis jalorensis*.

*Funambulus insignis jalorensis*, Bonhote, Fasciculi Malayenses, Zool; Pt. 1, p. 25 (1903).

*Funambulus peninsular*, Miller, Smithsonian Miscellaneous Collections, vol. 45, p. 25 (1903).

*Lariscus insignis jalorensis*, Robinson and Kloss, Journ., Fed. Malay States Mus., V, p. 120 (1914).

1 ♂ adult. Khao Wang Hip (Upper camp), Peninsular Siam. Sept. 1915. [No. 2058.]

This is another Malayan species which nearly reaches its northern limit in Nakon Sritamarat. It is a ground-squirrel which ascends low bushes in its search for food.



In colour the upper side is a grizzle of ochraceous-buff and blackish and there are three clearly defined black stripes from the shoulders to the base of the tail, which is like the upper parts but more coarsely annulated. The under parts of the body are white or creamy.

Native collector's external measurements:—head and body, 167; tail, 96 (imperfect); hind foot, 42 mm.

Dimensions of a skull from Bandon:—greatest length 49.1; condylo-basilar length, 40.3; interorbital breadth, 13.5; zygomatic breadth, 27.7 mm.

### 26. *Dremomys rufigenis belfieldi*.

*Funambulus rufigenis belfieldi*, Bonhote, Journ. Fed. Malay States Mus., III, p. 9, pl. 1 (1908).

*Dremomys rufigenis belfieldi*, Robinson and Kloss, op. cit. supra, V, p. 122 (1914).

1 ♂ adult. Khao Wang Hip (Upper camp), Peninsular Siam, Sept. 1915. [No. 2057].

Compared with *D. rufigenis rufigenis*, Blanford, of Muleyit, Tenasserim, this race which inhabits the mountains of Peninsular Siam, is darker above with the cheeks and muzzle less bright and the hind feet like the back instead of being bright tawny.

Above, a dark grizzle of black and buff: sides of muzzle and cheeks Mars yellow. Under surface white, the grey bases of the hairs very conspicuous except on throat, and on the thighs where the white is bordered with ochraceous. Tail annulated black and white except the lower surface which is almost entirely orange-rufous. A large patch of pure white on the back of, and behind, the ear.

Another form, *D. r. adamsoni*, Thomas, occurs at Maymo, Burma, and in the Southern Shan States and probably will be found to occur in Northern Siam. The species is Chinese and Indo-Chinese.

(For measurements see table p. 31).

### 27. *Menetes berdmorei berdmorei*.

*Sciurus berdmorei*, Blyth, Journ. Asiatic Soc. Bengal, XIII, p. 603, (1849).

*Menetes berdmorei*, Robinson and Kloss, Journ. Fed. Malay States Mus., IV, p. 121 (1914).

1 ♂, Krabin, Central Siam. Nov. 1915. [No. 2045].



1 ♂, 1 ♀, Hup Bon, South-east Siam, 500 ft. July 1915. [Nos. 2015, 2019].

1 ♂, 1 ♀, Klong Bang Lai, Patiyu, Peninsular Siam. Jan. 1916. [Nos. 2079, 2081].

The specimens from Krabin and Hup Bon, N. E. and S. E. of Bangkok, closely resemble examples of *M. b. berdmorei* from Mergui, Tenasserim, taken in January, and also a series from Bandon, Peninsular Siam, collected in July, which I regard as members of the same subspecies; the only constant differences being that the muzzles are paler, being annulated with buff instead of ochraceous white, on the whole, the three black dorsal stripes are a little less defined.

The Patiyu specimens, coming from a locality intermediate between the more northern places and Bandon and taken in January, show greater differences; the upper surface, except the muzzle, being of a paler tone as, the annulations there and the yellow lateral stripes are Naples yellow or creamy rather than rich buff, while the median portion of the back between the light stripes is less ferruginous, being Sudan brown in colour. The white under surface is strongly washed with light orange-yellow instead of being white or washed with ochraceous.

In view of their provenance (surrounded by the others) it is impossible to rank them as a local race so—though they were taken in the same month as the Mergui specimens, which are old and perhaps discoloured—I think we must regard them as evidence that this race of *Menetes* undergoes some seasonal change, though this is a thing that is not so usual in the more equatorial portion of this region as it is farther north. The genus is Indo-Chinese with several races occurring in Siam or on its borders.

*Menetes berdmorei* is a squirrel with a speckled upper and white or yellowish under-surface and may be recognised by a pair of yellow stripes on each side. Black (or dark) dorsal, sub-dorsal and lateral stripes are also generally present but they vary much in intensity according to locality and to season. The back from shoulders to root of tail is much richer and redder in colour between the inner light stripes than is the rest of the upper surface.

(For measurements see table p. 31).



28. *Epimys vociferans vociferans*.

*Mus vociferans*, Miller, Proc. Biol. Soc. Washington, XIII, p. 138, pls. III and IV, fig. 3 (1901).

*Epimys vociferans*, Robinson and Kloss, Journ. Fed. Malay States Mus., V, p. 124 (1914); Wroughton, Journ. Bombay Nat. Hist. Soc., XXIII, p. 715 (1915).

1 ♂ adult. Maprit, Patiyu, Peninsular Siam. Dec. 1915. [No. 2069].

Exactly agrees with topotypes from Trang. Colour above mingled ochraceous and brownish-black, the pelage harsh and wiry but not spiny: below white extending broadly to the wrists but not reaching the hind feet, which are white with distinct brown centres above. Tail bicolored with a white tip and clad with white hair except on the dark portion.

(For measurements see table p. 32).

29. *Epimys vociferans herberti*, subsp. nov.

*Type*. Adult male (skin and skull). Author's No. 2053/CBK. Collected at Pak Jong, Eastern Siam, 900 ft., on Dec. 1st, 1915.

*Characters*. Differs from *E. vociferans* of Peninsular Siam in being duller above with the white of the under surface extending on to the muzzle and up the cheeks to the eyes.

*Colour*. Above clay-colour streaked with black by the tips of the hairs, this grizzling most pronounced dorsally; the limbs duller and browner; top of muzzle and a ring round the eye pale clove-brown. Under surface white, this colour extending over the upper lip to include the tip of the nose and part of the vibrissae roots and projecting upwards to reach the dark eye-ring. Hands and feet white with brown centres. Tail bicolored, the distal half white: the pale area clad with white hairs.

*Remarks*. I have compared the type, the only example obtained, with a large series from Trang and the differences are so marked that it is necessary to recognise it as representing a distinct race, which I have named after Mr. E. G. Herbert, whose collector was principally responsible for the excellent condition of the specimens in this collection.

(For measurements see table p. 32).



30. *Epimys surifer surifer*.

*Mus surifer*, Miller, Proc. Biol. Soc. Washington, XIII, p. 148, pl. IV, figs 4, 4a, 4b (1900).

*Epimys surifer*, Robinson and Kloss, Journ. Fed. Malay States Mus., V, p. 125 (1914); Wroughton, Journ. Bombay Nat. Hist. Soc., XXIII, p. 714 (1915).

1 ♂ adult, 1 ♀ sub-adult. Maprit, Patiyyu, Peninsular Siam. Dec.-Jan. 1915-6. [Nos. 2074, 2070].

Very typical examples but with the white of the underparts continued to the hind foot. Above mingled ochraceous and brownish-black, pelage very stiff and wiry; below white. Hands and feet white. Tail bicolored with a white tip.

One of the commonest of spiny forest-rats and originally described from Trang.

(For measurements see table p. 32).

31. *Epimys surifer finis*.

*Epimys surifer finis*, Kloss, P. Z. S., 1916, p. 51.

2 ♂, 3 ♀, Pak Jong; 3 ♂, 3 ♀, Hinlap, Eastern Siam, 900 ft. Nov.-Dec. 1915. [Nos. 2051, 2052, 2054, 2055, 2056, 2058-2064].

This race differs from *E. s. surifer* in being rather duller in colour above while the white of the undersurface is usually continued to the hind foot, the contrary being generally the case with that form. The series from Hinlap is even duller and more blackened than paratypes from the extremity of South-east Siam, but several of the specimens are somewhat immature.

(For measurements see table p. 32).

32. *Epimys rattus*, subsp.

*Mus rattus*, Linn. Syst. Nat. I, p. 83 (1766); Blanford (partim), Faun. Brit. Ind., Mamm., p. 106 (1891); Flower (partim), P. Z. S., 1900, p. 361.

1 ♂ imm. 1 ♀ adult. Krabin, Central Siam. Nov. 1915. [Nos. 2039, 2042].

1 ♂ adult. Maprit, Patiyyu, Peninsular Siam. Dec. 1915. [No. 2068].

These specimens are evidently the same as Flower's Bangkok rats, and also seem to agree with *E. r. portus, mihi*, from Koh Si Chang, but the material is insufficient for satisfactory determination.

(For measurements see table p. 32).



33. *Epimys validus*.

*Mus validus*, Miller, Proc. Biol. Soc. Washington, p. 141, pls. III and IV, fig. 1 (1900).

*Epimys validus*, Robinson and Kloss, Journ. Fed. Malay States Mus., V, p. 125 (1914); Wroughton, Journ. Bombay Nat. Hist. Soc., XXIII, p. 715 (1915).

1 ♂ adult. Klong Bang Lai, Patiyu, Peninsular Siam. Jan. 1915. [No. 2078].

This is a large, coarsely-furred, jungle rat, the upper parts mingled black and buff and the underside buffy; nearly everywhere the grey base of the fur shows through and modifies the above colouration. The tail is black throughout and the hind feet are thinly clad with dark hair.

The skull is strongly and heavily built and is distinguished from all other local species of *Epimys* by the marked protuberance (mandibular tubercle) on the outer side of the ascending ramus of the mandible, a feature which occurs in the bandicoot rats (some of which *E. validus* superficially resembles) in a still more exaggerated degree.

(For measurements see table p. 32).

34. *Epimys ferreocanus*.

*Mus ferreocanus*, Miller, Proc. Biol. Soc. Washington, XIII, p. 140, pls. III & IV, fig. 3 (1900); Robinson and Kloss, Journ. Fed. Malay States Mus., IV, p. 124 (1909).

*Epimys ferreocanus*, Robinson and Kloss, op. cit. VI, p. 238 (1916).

1 ♂ imm. Maprit, Patiyu, Peninsular Siam. Jan. 1916. [No. 2076].

This rat was described from Trang and extends as far south as Perak: the present specimen is the most northerly example I have seen and the youngest, and the only one with the tail dark throughout.

The fur is largely composed of fine pliable spines and is a lustrous purplish-brown above in adults, nearly always frosted by whitish tips. The under parts are pure white and there is generally a little patch of white hair immediately below the orifice of the ear. The feet are brown or parti-coloured, and the tail in full-grown animals has the sharply defined terminal half to fourth of a yellowish-white colour.

The upper incisors are pale orange-yellow, while the lower are ivory-white and unusually long and slender.



Dimensions of an adult specimen:—head and body, 250 ; tail, 270 ; hind foot, 53 ; ear, 30 mm.

Skull:—greatest length, 53 ; diastema, 17 ; upper molar row, 10 ; length of palatal foramina, 8.7 ; median nasal length, 22 ; zygomatic breadth, 26 mm.

### 35. *Muntiacus muntjak* subsp.

*Cerrulus muntjac*. Blanford (partim), Faun. Brit. Ind., Mamm., p. 532 (1891).

1 ♂ imm. Klong Wang Hip, Tung Sawng, Peninsular Siam. Oct. 1915. [No. 2036].

This is the skull and head-skin of a young buck barking-deer, which still retains part of its milk dentition. It is impossible to say to what race it belongs.

### 36. *Cervus unicolor equinus*.

*Cervus equinus*, Cuv., Ossements Fossiles, ed. 2, IV, p. 45, pl. V, figs 37 and 38 (1823).

*Cervus unicolor*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 543 (1891).

*Cervus unicolor equinus*, Gairdner, Journ. Nat. Hist. Soc. Siam, I, p. 117 and plate (1914); Gyldenstolpe, Arkiv för Zoologi, Stockholm, vol. 8, No. 23, p. 30 (1914); Lydekker, Cat. Ungulates, Brit. Mus., IV, p. 78 (1915).

*Rusa unicolor*, Wroughton, Journ. Bombay Nat. Hist. Soc., XXIII, p. 718 (1915).

1 ♂ juv., 1 ♂ imm. Maprit, Patiyu, Peninsular Siam. Jan. 1916. [Nos 2073, 2071].

2 ♀ adult. Klong Bang Lai, Patiyu, Peninsular Siam. Dec.-Jan. 1915-6. [Nos. 2083, 2082].

These specimens not only illustrate the feature in Sambur that has been called the "blood-spot," but they also show the extent to which consequent denudation of hair on the neighbouring parts may be carried.

In the first example, a male fawn, there is no bare area at all on the throat but in the next, an immature male, there is a circular bare space about six inches in diameter, the centre of which is superficially granulated and was apparently slightly raw in life: this "blood-spot" is situated where a whorl of hair occurs in the youngest animal and is



quite small, about an inch as a half in diameter. It is present in both the adult females and, while in one there is a ring of bare skin 9-12 inches broad right round the neck, in the last the neck is entirely devoid of hair from the ears to the shoulders—a depth of 20—24 inches! The blood-spot is apparently still in the same place and is quite small in area.

Both Major G. P. Evans<sup>1</sup> and Mr. P. R. Kemp<sup>2</sup> have dealt with this curious development at some length and offered various explanations to which I am unable to add: that the sore occurs where the smoothness of the pelage is broken on the throat and that the resulting bareness may extend over the entire neck are the only unnoted details I can contribute.

Evans says that the sore occurs both on Indian and Burmese Sambar, and Wroughton (l.c.s.) records it from South Tenasserim, but Kemp has not found it on animals from Pitsanulok, Central Siam, nor from Peninsular Siam: it is found, though not always, in *Rusa* of the Malay States, but is not accompanied by the large areas of bare skin exhibited by the present animals. Nobody seems to have noticed it in captive deer.

### 37. *Tragulus kanchil ravus*.

*Tragulus rarus*, Miller, Proc. Biol. Soc. Washington, XV, p. 173, (1902); Robinson and Kloss, Journ. Fed. Malay States Mus., V, p. 127 (1914).

*Tragulus kanchil rarus*, Wroughton, Journ. Bombay Nat. Hist. Soc., XXIII, p. 717 (1915).

*Tragulus javanicus*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 556 (1891).

1 ♀ imm. Maprit, Patiyu, Peninsular Siam. Jan. 1916. [No. 2092].

This is an example of the Malayan Lesser Mouse-deer with the broad black nuchal stripe which differentiates it from *T. k. affinis* of the more eastern portion of Siam. Head and body, 459; tail, 73; hind-foot, 127; ear, 39 mm. The milk dentition is partially retained and the last molars are not up.

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<sup>1</sup> Big-game Shooting in Upper Burma, pp. 144-8 (1911).

<sup>2</sup> Journ. Nat. Hist. Soc. Siam, I, p. 51 (1914).



## Measurements of Siamese Squirrels in Millimetres.

	Sex	Head and Body	Tail	Hind foot	SKULL.							No.	Remarks
					Greatest length	Condylar length	Palatal length	Diastema	Upper molar row	Median nasal length	Inter-orbital breadth	Zygomatic breadth	
<i>Sciurus falaysoni</i>													
Krabiri, Central Siam	♂	237	204	55	56.2	47.5	23.0	12.9	10.7	16.5	...	33.0	2037
"	♂	254	242	54	54.5	46.0	22.1	12.6	10.4	16.0	21.0	31.3	2038
"	♂	233	213	51	53.5	44.8	21.6	11.6	10.4	16.0	19.2	31.0	2046
"	♂	258	246	55	57.0	48.2	23.0	12.9	11.0	16.1	20.9	33.5	2047
"	♂	227	221	52	56.4	47.2	23.2	13.0	10.4	16.4	21.0	33.0	2048
<i>Sc. nov.</i>													
Hup Bon, S. E. Siam	♂	235	224	48	55.0	46.8	23.0	12.2	10.7	17.0	20.4	32.2	2014
"	♂	229	223	48	55.0	45.8	22.9	12.1	10.7	16.3	20.9	...	2016
<i>Sc. boacourtii</i>													
Sam Koh, Central Siam	♀	192	171	43	48.8	40.5	19.7	10.8	9.7	13.3	17.2	29.4	2013
<i>Sc. caniceps</i>													
Krabiri, Central Siam	♀	262	224	45	58.0	49.0	24.0	13.1	11.0	17.0	20.2	32.5	2043
"	♀	243	242	52	57.0	48.0	24.0	13.0	11.6	17.0	19.5	32.0	2044
Tenasserim*	...	...	...	...	57.0	48.8	23.4	12.8	11.1	16.3	20.6	33.0	*
<i>Sc. cancolor milleri</i>													
Klong Wang Hip, Peor, Siam	♀	226	238	46	55.0	46.4	22.7	12.5	10.6	16.0	19.0	30.6	2033

\* One of the type of *S. chrysionotus*, Blyth: Indian Museum Registered No. 9476, *S. caniceps* c<sup>2</sup> of Sclater in Cat. Mamm. Ind. Mus. II.



Measurements of Siamese Squirrels in Millimetres.

	Sex	Head and Body	Tail	Hind-foot	SKULL							No	Remarks
					Greatest length	Condylar length	Palatal length	Diastema	Upper molar row	Median nasal length	Inter-orbital breadth	Zygomatic breadth	
<i>Sciurus erythraeus ruberulus</i>													
Khao Wang Hip, Penr. Siam	♂	240	214	48	53.2	45.0	22.0	11.8	10.8	13.6	19.5	30.3	2026 Sub-adult
<i>Sci. vittatus minidulus</i>													
Khao Wang Hip, Penr. Siam	♂	229	189	43	49.0	41.8	20.5	11.6	9.0	14.1	18.2	29.7	2025
<i>Sci. tonis surdus</i>													
Khao Wang Hip, Penr. Siam	♂	147	101	31	37.3	31.2	15.5	8.3	7.0	11.9	12.4	22.8	2021
<i>Tamias rodolphi</i>													
Krabai, S. E. Siam	♂	138	119	29	32.6	27.8	13.2	7.6	5.9	10.7	8.0	20.8	2040
<i>Dremomys rufigenis belfieldi</i>													
Khao Wang Hip, Penr. Siam	♂	220	161	46	55.4	45.0	23.2	12.4	10.5	16.0	18.3	28.5	2027
<i>Menetes berdmorei berdmorei</i>													
Hup Bon, S. E. Siam	♂	192	127	43	48.0	41.4	22.3	12.3	10.1	11.5	13.2	24.3	2015
" "	♀	186	146	42	48.2	40.7	22.0	12.4	10.0	12.0	13.0	25.0	2019
Krabai, Central Siam	♂	201	153	41	50.0	43.0	24.0	13.7	10.0	12.2	13.0	25.6	2045
Klong Bang Lai, Penr. Siam	♂	203	94	41	49.3	42.6	23.2	12.4	10.3	13.2	15.0	26.3	2079
" "	♀	196	136	44	51.0	44.0	25.0	14.2	10.0	13.0	14.5	26.4	2081



## Measurements of Siamese Rats in Millimetres.

	Sex	Head and Body	Tail	Hind-foot	SKULL							No	Remarks
					length	(condylo-basilar length)	Plastema	Upper tooth row	Length of alveolar Foramina	Median nasal length	Breadth combined nasals	Zygomatic breadth	
<i>Epimys eviferans eviferans</i> Maprit, Patiyu, Penr. Siam.	♂	236	314	41	54.0	46.2	13.6	10.2	7.1	20.4	6.0	25.0	2069
<i>Epimys eviferans heberti</i> Pak Jong, E. Siam	♂	231	335	45	54.0	45.0	13.2	9.6	7.1	21.0	6.1	24.0	2053
<i>Epimys sacifer sacifer</i> Maprit, Patiyu, Penr. Siam.	♂	200	216	..	45.0	37.4	13.0	6.8	6.2	17.6	5.1	19.0	2074
<i>Epimys sacifer fuscus</i> Pak Jong, E. Siam	♀	186	172	35	46.4	38.8	12.2	7.7	6.7	17.2	5.0	21.3	2051
" "	♂	183	190	37	45.0	37.8	11.8	7.3	6.3	18.0	4.8	19.3	2054
" "	♀	168	175	36	43.0	36.0	11.3	7.0	6.1	17.6	4.5	19.6	2055
" "	♂	188	imp.	38	45.2	38.0	12.2	7.1	7.0	17.1	4.8	20.0	2056
Hinlap "	♀	183	imp.	37	44.0	37.0	11.8	6.2	6.4	17.8	4.8	19.6	2058
" "	♀	172	183	36	44.0	36.9	12.0	7.1	6.1	16.6	4.8	19.5	2062
<i>Epimys rattus, subsp.</i> Krabin, Central Siam	♀	183	189	31	41.6	36.0	11.4	7.2	8.7	15.4	4.7	20.0	2042
Maprit, Patiyu, Penr. Siam.	♂	164	194	32	42.1	35.7	11.2	7.0	7.9	16.0	4.6	19.1	2068
<i>Epimys calidus</i> Klong Bang Lai, Penr. Siam.	♂	269	309	52	60.0	51.8	16.3	10.5	11.1	25.1	6.3	29.2	2078



## ON A NEW RACE OF FLYING SQUIRREL FROM SIAM.

By C. BODEN KLOSS, F.Z.S.

***Petaurista annamensis barroni***, subsp. nov.

*Type.* Adult skin and skull (sex unknown). Author's No. 2085, CBK. Collected at Hup Bon near Sriracha, South-east Siam, 500 ft., Dec. 1915, by Mr. P. A. R. Barron.

*Characters.* Perhaps most nearly allied to *P. annamensis*, Thomas, from South Annam<sup>1</sup> but differing in having a well-defined blackish ring round the eyes, white throat, and tail black on its distal third only. Upper tooth-row notably longer.

From *P. taylori*, Thomas, of south Tenasserim<sup>2</sup> it is distinguished by the greater extent of whitish grizzle on the upper surface, edge of interfemoral membrane black near the feet only, and greater amount of black at the end of the tail which is speckled basally with whitish; also apparently (as compared with an Indian Museum specimen collected at Mergui by Dr. J. Anderson) by the somewhat lighter tone of red on the upper surface and parachute and rather larger size.

From *P. lylei*, Bonhote, of North Siam<sup>3</sup> it differs in the lesser degree and extent of white grizzling above, in the white throat, white-tipped ears, white-edged parachute and drabby tail: it further lacks the dark spots above and below the eye, while the membranes, limbs and under-body are darker. It is also rather smaller.

*Colour.* General colour above chestnut anteriorly, Sanford's brown posteriorly, the bases of the hairs deep purplish-grey, the trunk speckled with white to about the same degree as *P. candidulus*, Wroughton, this frosting extending in a modified way to the limbs and along the tail on to the interfemoral membrane: throughout, the majority of the white-ringed hairs have black tips. Head more grizzled than back but the black tips less distinct. Muzzle and cheeks

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<sup>1</sup> Journ. Bombay Nat. Hist. Soc. XXIV, p. 204 (1915).

<sup>2</sup> tom. cit. supra, p. 205.

<sup>3</sup> P.Z. S., 1900, p. 192, plate XVIII.



white, the hairs with drabby-grey bases: areas before and behind the eye brownish-white with dark grey bases. Eye broadly ringed with black. Tip of nose and whisker patches blackish-brown. Ears with proectote dull white, metectote black, the latter colour extending to the hairs behind their bases. Edges of parachute white; of calcanea black; of interfemoral membrane black near the feet. Fore and hind-feet black.

Under surface of body light ochraceous-salmon becoming cinnamon-rufous on parachute, the latter colour extending to the sides of the neck and to the upper side of the membrane in front. A spot on the chin black narrowly edged with ochraceous; throat white.

Hair of free portion of tail drab with grey bases, except the terminal third above and the extreme tip which are black.

*Skull and teeth.* The skull is very robust with large bullae and the zygomatic spine is very pronounced, there being a distance of only about 5 mm. between it and the tip of the postorbital process. The termination of the combined nasals is markedly **Λ** shaped; in a skull of *P. taylora* it is slightly convex and the nasals are less produced anteriorly. The latter skull is considerably smaller with relatively small bullae, but has broader palate, mesopterygoid fossa and zygomata. While the skull measurement of *P. barroni* are practically the same as those of *P. annamensis* the teeth are much larger—the maxillary tooth-row, exclusive of the small anterior premolar, being 17.0 against 15.2 millimetres.

*Measurements.* Skull: greatest length, 77 (75);<sup>4</sup> condylo-basilar length, 67.2 (66.6); palatilar length, 35.7 (34); diastema, 16 (15.6); upper tooth-row, 18.2 (17.2); p<sup>1</sup>-m<sup>3</sup>, 17 (16.2); greatest length of nasals, 24.6 (22.5); greatest breadth of nasals 14. (13.1); least interorbital breadth, 19 (15.3); breadth between tips of post-orbital processes 39 (37.3); zygomatic breadth 49 (49.4).

*Specimens examined.* The type and another example obtained on 26th March 1902 in the Nampat district, Monthon Pitsanulok, Central Siam, by Mr. H. B. G. Garrett and now in the Indian Museum, Calcutta.

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<sup>4</sup> Measurements in parentheses those of an adult *P. taylora* from Mergui in the collection of the Indian Museum, Calcutta: they are given here because the type specimen, the only one on record, is without a skull,



*Remarks.* This is a race of flying-squirrel having, like *P. annamensis* and *P. taylori*, the external side of the ear, i.e., that nearest the crown of the head, clad in front (proectote) with short white hair, and posteriorly (metectote) with long black hairs.

From those three, *P. cinereus* and *P. candidulus* are distinguished by having no black hairs behind the ears, while in *P. lylei* and *P. l. venningi* the proectote is clad with rufous hairs. I should therefore group as follows:—

Ears variably rufous throughout...*cinereus* and *candidulus*<sup>5</sup>

Ears rufous and black .....*lylei* and *l. venningi*

Ears white and black.....*annamensis*, *taylori* and  
*a. barroni*

The skin from Pitsanulok is in good condition except that it lacks the tail. It only differs from the Hup Bon example in being of a little deeper shade and somewhat more widely grizzled above, but the latter feature is due to the fact that the pelage of the type is somewhat abraded across the shoulders and rump. The total length is recorded by the collector as 38 inches; the length of the tail as 21 inches. It is a female with three pairs of mammae. The skull is missing.

Mr. Barron has more recently sent me a young male of this squirrel which, it is most interesting to note, differs from the adult in that the back, instead of being hoary, is overlaid with black. The head and shoulders, upper side of limbs and membranes are as in the adult, but there are small red-brown patches above and below the dark eye-ring, and the membranes are edged with black externally to the white. The limbs and feet are more intensely and extensively black, and the black patches behind the ears are continued backwards to form an indistinct collar on the neck, behind which the whole of the body fur is black-tipped with the central portion of the hairs rufous-white. The black-tipped hairs are continued over the basal fourth of the tail which is next fulvous-white and then tawny with the last inch or so black above:

<sup>5</sup> Four specimens of *cinereus* from Arakan examined seem to have the proectote rufous; and though Wroughton states that this area is white in *candidulus* (Journ. Bombay Nat. Hist. Soc.; XX (1911) p. 1022) this is not borne out by six examples from Assam in which it is also rufous.



on the lower side the colours are the same except that the tawny element extends narrowly along the middle line almost to the tip. The under surface of the membranes is practically naked: the body and limbs are the same as the type but the calcaneal region is more blackened. Head and body, 195; tail, 205; hindfoot, 49; ear, 14.5 mm. [No 2091]

Mr. Barron writes "I have found three nests of this squirrel and in each there was only one young. The nest was placed in the hollow of a tree about 35 to 40 feet above the ground in the ever-green forest near Sriracha, where the original adult was found."



## DESCRIPTIONS OF FIVE TADPOLES FROM SIAM.

BY MALCOLM SMITH, M.R.C.S., L.R.C.P.

WITH TWO PLATES.

The following tadpoles have not been yet described.

That *Callula pulchra*, the common "bull-frog" of Bangkok and Singapore, should have remained so long unknown, is rather surprising, considering how plentiful and easily obtained it is.

*Microhyla ornata* is interesting, on account of the formation of its mouth, which is modified in a peculiar way for obtaining food from the surface of the water.

*Rana nigrovittata* and *Bufo parvus* were obtained this year in the mountain streams of Khao Sebab, Chantabun.

My thanks are due to Mr. C. L. Groundwater, for his very careful drawings illustrating this article.

### *Microhyla achatina*.

Head and body ; length,  $1\frac{3}{4}$  times to twice its breadth. Nostrils, rather far apart, midway between the eyes and the upper lip. Eyes, perfectly lateral, four times as far apart as the nostrils. Spiraculum, median, the transparent sheath opening below the centre of the coil of gut. Anal tube, median, long, curved, opening at the lower edge of the caudal membrane. Tail, twice as long as the head and body, about four times as long as deep, terminating in a fine point ; crests moderate, upper convex, at its greatest height nearly as deep as the lower, not extending on to the back ; lower crest nearly straight. Toes, almost fully webbed.

Mouth. I have left this until the last, as it presents unusual features, and is quite different from that of the other three species of *Microhyla* (*M. ornata*, *pulchra*, and *rubra*) at present known. As one would expect in this type of Batrachian, it has neither beak nor teeth. It consists of a horse-shoe shaped upper lip and a contractile lower one, the latter being furnished, in addition, with a large cutaneous expansion or flap, which can be erected or depressed at will. When the tadpole



is at rest, and is below the surface of the water, this flap is lowered and is curved backwards upon itself (Fig. AI); but when feeding at the surface, it is raised and spread out, (Figs. 2 and 4), and then forms a very shallow, saucer-like arrangement, the purpose of which is to act as a funnel, and to furnish as large an area as possible for catching any minute particles floating upon the water, and which are drawn towards it by the strong sucking action of the creature. The lower jaw is constantly in action, as has been already described with the other tadpoles of this genus. Whether these tadpoles actually feed upon particles in the water, I could not find out, but that the main supply is drawn from the surface, is shown by the frequency with which they are to be seen feeding there, and by the readiness with which, on shaking the dust of decaying vegetable matter on to the water, they will at once rise up and devour it. Large particles, or those which are not suitable as food, are rejected and promptly spat out again, but it is surprising, when the tadpole is fully grown, what big pieces will be swallowed. With the protrusion of the fore legs, this expansion commences to be absorbed, but the tadpole still continues to feed, though less greedily; and it continues to do so almost up to the time of leaving the water.

Colour. Dark brown to black; sides of the head and body, between the eyes and the coil of gut, more or less transparent. A gold mark between the eyes (very conspicuous when young), and with or without gold or orange patches upon the sides of the body and tail. Caudal membrane colourless, or with minute black speckles.\*

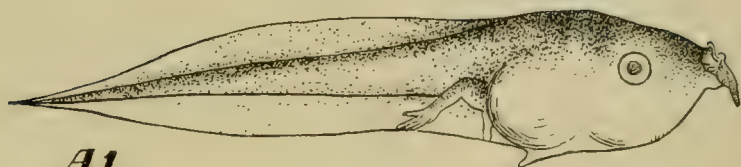
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\* Descriptions of the colouration of tadpoles must not be taken too strictly, as they are liable to variation. This variation appears to affect entire broods, rather than separate individuals. The original description of *M. achatina* was drawn up from specimens reared during 1914 and 1915. They were dark brown to black in colour, with a transparent patch on either side of the body between the eyes and the coil of gut, and a gold bar between the eyes. A brood taken this year had no transparent patch, and had, in addition to the gold bar on the forehead, a considerable amount of yellow along the flanks which later turned to orange. Another brood from near Paknampo, had a bright yellow spot at the base of the tail.

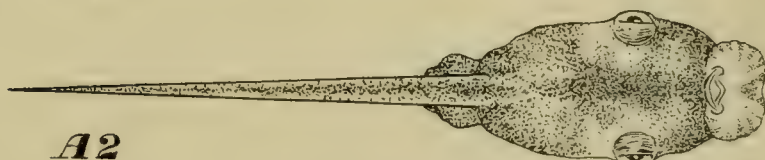
The "transparent" tadpole of *Microhylla ornata*, as described by Stanley Flower, is by no means always colourless, but can assume quite a respectable shade of grey-brown, whilst the peculiar arrangement of the pigmentation of the tail in Flower's unknown "transparent" tadpole, (P.Z.S. 1899, p. 903), may exist in both *M. ornata* and *M. achatina* and probably also does in others.

The tadpoles of *Callula pulchra* have considerable power of changing





**A1**



**A2**



**A4**

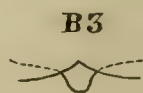


**A3**

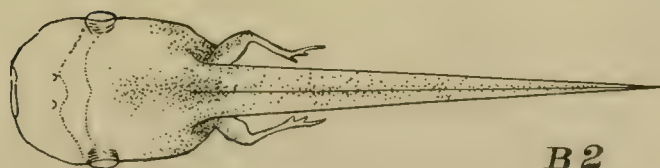
**MICROHYLLA ACHATINA**



**B1**



**B3**



**B2**

**x 2**



**CALLULA PULCHRA**







Dimensions. Total length, 20 to 22 mm. Head and body, 7. Depth of tail, 4. Expansion of lip, fully extended,  $2 \times 3$ . This structure may vary in size in different broods. The drawing (A 2) is from a large one and is by no means exaggerated,

The tadpole spends most of its time, almost motionless, a short distance below the surface of the water, rising at intervals to feed as described.

*Microhyla achatina* spawns throughout the rainy season in Bangkok. I have found the tadpoles in May, before the monsoon had properly broken, and I have found them again in June and July, and as late as October. The eggs are laid in masses and float on the surface of the water.

The young frog on leaving the water is of a light golden-brown colour above, with a broad dark wavy vertebral band (A 3). Many specimens at this stage are practically indistinguishable from the young of *M. ornata*. After two or three weeks they begin to assume the reddish tinge of adult life.

### *Microhyla pulchra*.

Characters ; similar to *M. ornata*, but larger (*vide*, Flower, P.Z.S., 1899, p. 902).

Colour, the same ; if anything, more transparent. As I have

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their colour, this change apparently being dependent upon their surroundings. I could induce it myself by changing the water in their tank. If it was muddy, they became olive, if clear, black, and the change would be effected in a few hours time. I once found a couple of specimens that were dirty pink in colour, so pale in fact that I thought I must have encountered some form of albinism. They were put aside by themselves, but on the following morning had resumed their usual dark brown colouration.

This power of changing colour is not necessarily carried into later life. The perfect form of *Calhula pulchra* does not possess it, whilst exactly the converse obtains with *Rhacophorus leucomystax*, the common Tree-Frog of Bangkok. The perfect frog is probably as versatile and rapid a quick change artist as any frog known, and can vary from a pale yellow or almost pink to a dark grey or brown in an exceedingly short space of time, yet its tadpole is unable to vary in colour in the slightest degree.

The size of tadpoles at the time of completing their metamorphosis may vary considerably, and depends chiefly upon their food supply. The descriptions here given are of well grown specimens, with the hind-limbs fully developed, and before the protrusion of the fore-limbs.



already mentioned in the footnote to *M. achutina*, the colouration and degree of transparency of *M. ornata* is by no means constant.

Dimensions. Total length 28 mm., head and body 9.

The specimens examined were obtained at Nong Pling, near Paknampo, in June.

I could find no reliable character except that of size, upon which to rely for a diagnosis between these two species. With half a dozen well grown living specimens of each in a dish together, it was not difficult to separate them, chiefly on account of the difference in size. Apart from this the snout of *M. pulchra* was shorter, the body less regularly oval in shape, and there was a particular green tint about the tadpole which made it easy to distinguish it from *M. ornata*. On none of these points however, could one rely, and in a preserved specimen they would disappear entirely.

The young on leaving the water have the handsome markings upon the back which are so characteristic of the adult.

### *Callula pulchra.*

Head and body ; length about  $1\frac{1}{2}$  times its breadth ; much flattened above ; snout very broad. Nostrils close together, much nearer the eyes than the tip of the snout. Eyes perfectly lateral, six times as far apart as the nostrils. Spiraculum median, large, the transparent sheath opening below the hinder end of the body. Anal tube long, median, curved downwards and backwards, projecting below the edge of the caudal membrane. Tail twice as long as the head and body, bluntly pointed ; crests full convex, about equal in depth.

Mouth simple (without horny beak or teeth), very small, placed at the extremity of the head, and consisting of a straight (viewed from above) upper lip, and a contractile lower one. Toes not webbed.

Colour. Dark olive-brown to black, with or without fine golden speckles. Below often speckled with white. Sometimes a pale curved bar across the snout, and light markings on the sides. Caudal membranes colourless, or with small dark patches.

Dimensions. Total length, 40 mm. Head and body, 14. Breadth of body, 9. Depth of tail, 7.5.

It will be seen from the above description that this tadpole



bears no resemblance whatever to the "transparent" tadpole of Stanley Flower (P. Z. S. 1899, p. 903), and which he believed to belong to this species.

A good account of the spawning habits of this frog has already been given by Mr. Ferguson (Journ. Bombay Nat. Hist. Soc., Vol. XV, p. 391, 1904), and there is no need here to repeat his remarks. I can, however, confirm them all.

*Callula pulchra* spawns in Bangkok at least twice during the rainy season. The first eggs are deposited some time during April. May or June, as soon in fact as a heavy fall of rain will provide them with a sufficient supply of water. As the exact time of deposition can never be foretold, the female is enabled to carry the eggs in her body for a considerable period, ready for expulsion as soon as the proper time arrives. I have found them stuffed with apparently ripe spawn as early as February. Shallow water is invariably chosen for breeding purposes. Deep puddles, such as form after an hour or two of heavy rain, or road-side drains are selected, whilst the deeper and more permanent water of ponds, even though close at hand and equally accessible, is avoided. The instinct of the preservation of species would here appear to be at fault, but this is overcome by the immense numbers of young which are produced. For the majority of these shallow puddles, unless more rain falls within a few days, dry rapidly up, and the inhabitants perish. Millions must die every season from this cause alone, but as Mr. Ferguson has remarked, "considering the vocal powers of the adults, this infant mortality can be contemplated without sadness."

The tadpoles of *Callula pulchra* are every active, constantly moving about from place to place in search of food. They are unable, by their own powers, to remain below the surface of the water, and unless tucked away beneath some leaf or stone or other matter, rise involuntarily to the surface, where they remain floating. They will devour both animal and vegetable matter, and the more putrid it is, the more they seem to like it. To watch them tackling a piece of meat or fruit, one would imagine them to be tadpoles of the Ranid type with horny beak and teeth, rather than to belong to the toothless Engystomatid group. The lower jaw is in constant movement.



The young on leaving the water vary from black to bronze brown, with light brown or golden patches on the limbs. The light flank mark may or may not be present.

They are very active, much more so than their parents, and given plenty of food grow rapidly. One I kept measured after two months 28 mm. from snout to vent.

***Rana nigrovittata.***

Head and body; length a little more than  $1\frac{1}{2}$  times the breadth; snout rounded. Nostrils nearer the tip of the snout than the eyes. Eyes towards the upper part of the head, looking outwards and upwards, not twice as far apart as the nostrils. Spiraculum sinistral, directed backwards and upwards, nearer the eye than the vent, prominent in life. Anal tube pointing straight backwards and downwards, opening on the right hand side of the caudal membrane. Mouth subterminal; sides with a single row of papillae, below a double row. Beak broadly edged with black, finely serrated; upper lip with a long continuous row of teeth, followed by a second row broadly interrupted by the beak; lower lip with three long continuous rows, or the upper very narrowly interrupted. Tail, about twice as long as the head and body, four times as long as deep; tip bluntly pointed; crests fairly full, upper equal to or a little deeper than lower, not extending on to the back; both slightly convex. Dorso-lateral fold defined. Toes nearly fully webbed.

Colour. Light olive to light brown, finely speckled with darker. A dark band passing through the nostril and eye on to the flank. Tail spotted with black. Below pale grey.

Dimensions. Total length, 37 mm. Head and body, 13. Breadth of body, 8. Depth of tail, 6.

The young on leaving the water resemble their parents.

Large numbers of these tadpoles were found at the end of March, in the small mountain streams of Khao Seab, Chantabun. They were found at all elevations up to 1,500 feet, inhabiting the quiet pools and backwaters branching off from the main current.

***Bufo parvus.***

Head and body; length  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times its breadth; snout rounded. Nostrils nearer the eyes than the tip of the snout. Eyes towards the upper surface of the head, looking outwards and slightly upwards,





**RANA NIGROVITTATA**



**BUFO PARVUS**







twice as far apart as the nostrils. Spiraculum sinistral, directed backwards and upwards, a little nearer the eye than the vent. Anal tube short, median, directed backwards and downwards. Mouth subterminal; beak broadly edged with black, finely serrated; papillæ short, at the sides of the mouth only; upper lip with two long series of teeth, the lower narrowly interrupted; lower lip with three long series of uninterrupted teeth. Tail short, one and a half times as long as the head and body, about three times as long as deep, tip rounded; crest full, convex, upper equal to or a little deeper than lower, not extending on to the back. Toes webbed at the base.

Colour. Head and body blackish; muscular portion of tail pale brown; membranes almost colourless.

Dimensions. Total length, 25 mm Head and body, 10; depth of tail, 4.5.

The young on emerging from the water are bronze-brown in colour, usually with a pinkish patch across the snout, and others upon the body, these patches increasing in size and number as the little creature grows. The parietal ridges are not apparent at first, but begin to appear in about five weeks time.

The tadpoles were found on Khao Sebab, and were taken at the same time and in similar situations as the preceding species.

In company<sup>^</sup> with another species of frog with a remarkable dermal flap on the top of its head, and which I believe to be new to Science, *Rana nigrovittata* and *Bufo parrus*, were the only Batrachians met with upon this hill at any elevation. I was unfortunately just too late to procure the tadpole of this unknown frog, but found plenty of the young ones just leaving and having left the water.

Whether these hill dwellers breed at any other time, I do not know, but one is led to infer that it is an instinct of preservation which leads them to spawn at this particular season, the driest time of the whole year, and the very opposite to that chosen by those species which inhabit the plains. For at no other time could such suitable conditions be found. Every stream on this steep hill during the wet monsoon, must become a small torrent, washing down all before it, and obliterating those quiet pools and backwaters which are so necessary for the development of these tadpoles.



DESCRIPTIONS OF THREE NEW LIZARDS AND A NEW SNAKE  
FROM SIAM.

By MALCOLM SMITH, M.R.C.S., L.R.C.P.

WITH A PLATE.

***Lygosoma tersum*, sp. nov.**

Section *Iimulia*. Distance between the snout and the fore limb  $1\frac{1}{4}$  times in distance between the axil and groin. Limbs well developed, pentadactyle. The hind limb reaches the elbow. Lower eyelid scaly. No supranasals. Snout obtusely pointed; rostral convex, forming a curved suture with the frontonasal; præfrontals forming a median suture or just in contact; frontal very narrow behind, as long as the frontoparietals and and interparietal together; parietals in contact behind the interparietal; no nuchals. Four large supraoculars. Fifth and sixth supralabials largest and subocular. Ear opening oval,  $\frac{2}{3}$  size of eye opening; no lobules. 34 smooth scales round the middle of the body, laterals smallest, dorsals largest. A pair of enlarged præanals. Digits fairly long, compressed, 19 obtusely keeled lamellæ beneath 4th toe.

Colour. Dark brown above, uniform or with indistinct darker brown and black spots and variegations, the spots tending to be, arranged in longitudinal lines. Flanks lighter, with or without similar markings. Below white. Lips with dark vertical bars at the sutures.

Length. Snout to vent, 92 mm., tail 170.

Described from two specimens taken in the mountains of Nakon Sritamarat (Khao Wang Hip), Peninsular Siam. Altitude about 1000 feet.

The species is allied to *Lygosoma indicum* from the Eastern Himalayas, Assam, Burma and Siam, from which it differs in its larger size, in the number of scales round the body, and very distinctly in colouration.











***Lygosoma herberti*, sp. nov.**

Section *Riopa*. Distance between the end of the snout and fore-limb  $1\frac{4}{5}$  times in distance between the axil and groin. Limbs well developed, pentadactyle, not meeting when pressed against the body. Snout obtuse; lower eyelid scaly; supranasals present, in contact behind the rostral; frontonasal in broad suture with the frontal, the latter as long as the frontoparietals and interparietal together; praefrontals small and widely separate; parietals in suture behind the interparietal; no nuchals. Four large supraoculars. Fifth supralabial subocular and very long, nearly as long as the three preceding it together. Ear opening small, round. 28 scales round the middle of the body, subequal, dorsals with 5 strong keels, laterals less strongly keeled. Præanals barely enlarged. Digits moderate, compressed; fourth toe a little longer than third, with 14 obtusely keeled subdigital lamellæ.

Colour. Bronze-brown above, light brown below. A faint dark dorso-lateral band, passing through the eye and best marked over the shoulder. Sides of neck, body and tail with indistinct pale spots, each spot being confined to a scale.

Length. Snout to vent, 54 mm., tail 64.

Described from a single specimen obtained at the foot of the Nakon Sritamarat mountains (Khao Wang Hip), Peninsular Siam.

This species is nearest to *Lygosoma howringii*, from which it differs in the carination of the scales as well as in colour.

I have named this species after Mr. E. G. Herbert, to whose collaboration and help in collecting during the past two years, I owe much.

***Lygosoma rupicola*, sp. nov.**

Section *Liolepisma*. Distance between the end of snout and fore-limb  $1\frac{1}{5}$  times in distance between axil and groin. Limbs well developed, pentadactyle: the hind limb reaches the elbow. Snout obtusely pointed. Lower eyelid with an undivided transparent disc. No supranasals. Rostral convex, forming an almost straight suture with the frontonasal; praefrontals forming a median suture; frontal very



narrow behind, shorter than the frontoparietals and interparietal together. Nuchals feebly enlarged. Four large supraoculars. Fifth and sixth supralabials largest and below the eye. Ear opening large, oval, nearly as large as the eye opening; no lobules. 36 smooth scales round mid-body, laterals scarcely, if any, smaller than dorsals or ventrals; a pair of enlarged prænals. Digits rather long, 17 to 18 obtusely keeled lamellae beneath the 4th toe.

Colour. Light brown above, with a series of largish, irregularly shaped, black spots down the middle of the back; upon the neck they are paired. A dark brown or black band starting from behind the eye, and broadening as it passes along the upper half of the flank on to the base of the tail, where it disappears. It is broken at intervals by light spots. Below white. Tail light yellowish brown, (pinkish in life). Labials with faint dark spots at the sutures.

Length. Snout to vent 34 mm., tail 58.

Described from a single specimen taken among lime-stone rocks at Chong Kae, near Paknampo, Central Siam.

The species is allied to *L. melanosticum*, Blgr., from northern Tenasserim and Siam, from which it differs in the longer limbs, smaller size, and very distinctly in colouration.

A second specimen of this lizard has been taken at Hin Lap in the Dong Rek mountains, E. Siam. It agrees in every particular with the type.

#### **Simotes barroni, sp. nov.**

Nasal divided; portion of rostral visible above equal to or less than the interpræfrontal suture, which is longer than the internasal suture; frontal longer than its distance to the end of the snout, shorter than the parietals; loreal as long as deep or a little longer than deep; 1 præ- and 2 post-oculars; no sub-ocular; 1 long anterior temporal, followed by a pair; 7 supra-labials, the 3rd and 4th entering the eye; 4 infralabials in contact with the anterior chin-shields, which are twice as long as the posterior. Scales smooth; in 17 rows in the middle of the body, in 15 rows two heads' lengths in front of the vent. Ventrals 141—146; anal single; sub-caudals 39—44.

Colour; above light brown, with a series (10-11 on the body and 3 on the tail) of large dark brown, black-edged spots placed



transversely across the body. They are more or less indented mesially, and confluent with a smaller spot on either side. Between each spot are 3 indistinct cross bands, produced by a black edging to some of the scales. Below yellowish-white (coral red in life) with black quadrilateral spots on either side. Head with dark brown, light-edged marks of the *Sinotes* pattern, namely; a broad crescent on the snout, passing through the eyes on to the lips, an oval spot on the top of the head, confluent or not with an oblique band passing on to the sides of the throat, and with the apex of a heart-shaped mark on the nape.

Total length 380 mm., tail 70.

Described from 3 specimens taken at Hup Bon, E. of Sriracha S. E. Siam, by Mr. P. A. R. Barron, to whom I have dedicated the species.

This snake has been found also at Sriracha, at Koh Lam, a small island near, and at Muak Lek (alt. 900 ft.) in the Dong Rak range, E. Siam. The specimen from Muak Lek has 160 ventrals, two specimens from Sriracha 33 and 34 subcaudals respectively, whilst a third has only 135 ventrals. The formula will therefore now read; ventrals 135-160, sub-caudals 32-44. One specimen from Sriracha has 8 supra-labials on each side with the 4th and 5th entering the eye. Three more have 7 on one side, 8 on the other. In one Sriracha specimen there are no large dorsal spots on the anterior three-quarters of the body.

Types of all the above named species are being deposited in the British Museum with Mr. G. A. Boulenger, to whom I am indebted for confirming my belief that they were new to science.



**A LIST OF THE CROCODILES, TORTOISES, TURTLES AND LIZARDS  
AT PRESENT KNOWN TO INHABIT SIAM.**

BY MALCOLM SMITH, M.R.C.S., L.R.C.P.

The following list comprising 4 crocodiles, 21 tortoises and turtles, and 66 lizards, cannot by any means be considered to represent the total number of species which will ultimately be found to inhabit this country. Of the fresh-water tortoises and turtles of Siam proper, practically nothing is yet known, whilst in the large family of lizards, particularly among the geckoes and the smaller species of skinks, many forms must still remain to be discovered.

Numerous additions have been made since Stanley Flower compiled his list in 1899, the last naturalist to make a complete list of the reptiles of Siam. Most of these additions are from the Peninsula, and have been incorporated in Mr. Boulenger's recent work on the Reptiles of the Malay Peninsula.

*Acanthosaura horrescens* and *Isopachys gyldenstolpei* were discovered by Count Gyldenstolpe in 1914, and described this year (Results of the Swedish Zoological Expedition to Siam, II, Lizards).

I have added 1 tortoise and 17 lizards to the list myself, amongst which may be mentioned *Gymnodactylus oldhami*, *Lygosoma olivaceum*, *L. vittigerum*, *L. laterale*, and *Tropidophorus gunnanensis* and *cochin-chinensis*, together with the four new species which have already been described in the pages of this Journal. The remainder, although not definitely recorded from the country before, might, from their previously known distribution, have been reasonably expected to occur here.

Certain changes in nomenclature have been made, which are as follows.

*Cyclemys annandalii* becomes the type of a new genus. The skull of this tortoise, in its absence of a bony temporal arch, resembles *Geoemyda*, but in other characters it differs sufficiently to merit separation from it, and to be placed by itself. For this new genus Mr. Boulenger has proposed the name *Hieremys*, as the original specimens



which I sent him and upon which he based the genus had been obtained from the Chinese Temple in the Wat Mahan Road, Bangkok.

*Lygosoma præsigne* is removed from its present position and placed under *Mabuia*.

*Acanthosaura crucigera* is united with *A. armata*,

My thanks are due to Mr. G. A. Boulenger, F. R. S., for his help on several points in connection with this paper, and for his kind and courteous assistance on numerous occasions in assisting me in the diagnosis of specimens which I have sent him.

The distributions here recorded, refer, of course, to our present knowledge, and must by no means be considered as final.

The geographical divisions used are those proposed by Mr. Boden Kloss in this Journal (Vol. 1, p. 250). I have used the term South-western for that portion of Western Siam, south of the Petchaburi river.

Bangkok, May, 1916.

## EMYDOSAURIA.

### CROCODILIDÆ.

#### 1. TOMISTOMA SCHLEGELII (S. Mull.).

Inland Sea (Peninsular Siam).

#### 2. CROCODILUS POROSUS Schneid.

Common in most of the large estuaries opening into the Gulf, at any rate as far south as Bandon. Not found in the River Chao Praya.

#### 3. CROCODILUS PALUSTRIS Lesson.

Rivers of Central and Western Siam in suitable localities. The existence of the Marsh Crocodile in the Malay Peninsula is doubtful, and I have not yet been able to trace it in Siam further south than the Qua Noi river, north of Lat. 14°.

#### 4. CROCODILUS SIAMENSIS Schneid

Eastern Siam.

## CHIELONIA.

### TRIONYCHIDÆ.

#### 1. TRIONYX CARTILAGINEUS (Bodd).

Rivers of Central, South-eastern and Peninsular Siam, where it is not uncommon.



2. *TRIONYX HURUM* Gray.

Recorded from Bandon (Peninsular Siam), with doubt. (Rob. and Kloss, Journ. Fed. Malay States Mus., V, p. 152).

3. *PELOCHELYS CANTORIS* Gray.

River Chao Praya (Central Siam), with doubt. (Flower, P. Z. S., 1899, p. 621).

## TESTUDINIDÆ.

4. *TESTUDO EMYS* Schleg. & Müll.

Hills of Western and Peninsular Siam.

5. *TESTUDO ELONGATA* Blyth.

Western, South-eastern and Peninsular Siam. Common in suitable localities.

6. *TESTUDO LATINUCHALIS* (Vaill.)

Chantabun (South-eastern Siam).

7. *GEOEMYDA SPINOSA* (Gray).

Nakon Sritamarat and Patani (Peninsular Siam).

8. *GEOEMYDA GRANDIS* Gray.

Central, Western and Peninsular Siam. Fairly common.

*HIEREMYS*, genus nov.

Allied to *Geoemyda* in the absence of a bony temporal arch, but differing from it in the much broader alveolar surface to the jaws, in the deeply serrated margins to the jaws, and in the broader digital webs.

From *Cyclemys* it may be distinguished by the want of a bony temporal arch, by the plastron being united to the carapace by suture instead of ligamentous hinge, and by the absence of any hinge between the hyo- and hypoplastral bones.

Type. *Hieremys annandalei* (*Cyclemys annandalei* Blgr.), from Patani.

9. *HIEREMYS ANNANDALEI* (Blgr.).

*Cyclemys annandalei*, Blgr., Fascic. Malay., Zool. I., p. 142, (1903); id., Rept. Malay Penin., p. 19 (1912); Rob. and Kloss, Journ. Fed. Malay States Mus., V. p. 153 (1914).

Peninsular Siam and (?) River Chao Praya (Central Siam).

10. *CYCLEMYS PLATYNOTA* (Gray).

Patani (Peninsular Siam).



11. *CYCLEMYS DHOR* (Gray).

Widely distributed. Common in certain localities.

12. *CYCLEMYS AMBOINENSIS* (Daud.).

Central and Peninsular Siam. Common round Bangkok.

13. *CYCLEMYS MOUHOTI* Gray.

Eastern Siam.

14. *BELLIA CRASSICOLIS* (GRAY).

Central, South-western and Peninsular Siam. Not uncommon round Bangkok.

15. *DAMONIA SUBTRIJUGA* (Schleg. and Müll.).

Central and Peninsular Siam. Common round Bangkok.

16. *CALLAGUR PICTA* Gray.

River Chao Praya (Central Siam), with doubt. (Flower, P.Z S., 1899, p. 610).

17. *BATAGUR BASKA* (Gray).

Patani (Peninsular Siam).

18. *PLATYSTERNUM MEGACEPHALUM* Gray.

Western and (?) Northern Siam.

## CHELONIDÆ.

19. *CHELONE MYDAS* (Linn.).

Gulf of Siam. Very common.

20. *CHELONE IMBRICATA* (Linn.).

Gulf of Siam. Common.

21. *THALASSOCHELYS CARETTA* (Linn.).

Gulf of Siam, with doubt. (Flower, P. Z. S., 1899, p. 618).

## LACERTILIA.

## GECKONIDÆ.

1. *GYMNODACTYLUS MARMORATUS* (Fitz.).

Patani (Peninsular Siam).

2. *GYMNODACTYLUS PULCHELLUS* (Gray)

Patani and Nakon Sritamarat (Peninsular Siam).

3. *GYMNODACTYLUS PEGUENSIS* Blgr.

Patelung and Nakon Sritamarat (Peninsular Siam), Sai Yoke district (Western Siam).

4. *GYMNODACTYLUS OLDHAMI* Theob.

Patiyu (Peninsular Siam).



5. *GONATODES KENDALLI* (Gray).

Patani (Peninsular Siam).

6. *GONATODES AFFINIS* (Stol.).

Patani (Peninsular Siam).

7. *PHYLLODACTYLUS SIAMENSIS* Blgr.

Widely distributed; extending into the Peninsula as far South as Bangsaphan, Lat.  $11^{\circ} 13'$ . Very common in some localities.

8. *HEMIDACTYLUS FRENATUS* Dum. & Bib.

Common almost everywhere.

9. *HEMIDACTYLUS PLATURUS* (Schneid).

Common almost everywhere.

10. *LEPIDODACTYLUS CEYLONENSIS* Blgr.

Klong Menao (South-eastern Siam).

11. *MIMETOZOOM CRASPEDOTUS* (Mocq.).

Island of Samui (Peninsular Siam).

12. *GEHYRA MUTILATA* (Wiegman).

Common almost everywhere.

13. *GECKO VERTICILLATUS* Laur.

Common, and widely distributed.

14. *GECKO STENTOR* (Cantor),

Rhaman (Peninsular Siam).

15. *PTYCHOZOOM HOMALOCEPHALUM* (Ureveltdt).

Hup Bon, near Sriracha, and Chantabun (South-eastern Siam); Dong Rek Mountains (Eastern Siam); Patani (Peninsular Siam).

## AGAMIDÆ.

16. *DRACO VOLANS* Linn.

Peninsular Siam as far north as Nakon Sritamarat.

N.B.—My reference to this species from the Sai Yok district (Vol. 1, p. 153, of this Journal) is an error for *D. maculatus*.

17. *DRACO MACULATUS* Gray.

Widely distributed throughout the country except towards the South-east, where it is replaced by the following.

*DRACO MACULATUS* HAASHI Smith and Kloss.

South-eastern Siam and the Dong Rek range.

18. *DRACO FIMBRIATUS* Kuhl.

Patani and Nakon Sritamarat (Peninsular Siam).



19. *DRACO PUNCTATUS* Blgr.

Patani (Peninsular Siam).

20. *DRACO CYANOLEMUS* Blgr.

Bandon ( Peninsular Siam ).

21. *DRACO FORMOSUS* Blgr.

Peninsular and Western Siam as far north as Lat. 14° 30'.

22. *DRACO TÆNIOPTERUS* Günth.South-eastern Siam ; Dong Rek Mountains (Eastern Siam) ;  
Muang Song forest, Pre ( Northern Siam ).23. *DRACO BLANFORDI* Blgr.Peninsular Siam ; Sai Yok district ( Western Siam ) ; Muang  
Song forest, Pre (Northern Siam).24. *DRACO MELANOPOGON* Blgr.

Nakon Sritamarat (Peninsular Siam).

25. *DRACO MICROLEPIS* Blgr.

Island of Pennan (Peninsular Siam).

26. *DRACO QUINQUEFASCIATUS* Gray.

Patani and Trang (Peninsular Siam).

27. *GONYCEPHALUS BORNEENSIS* (Schleg.)

Bandon (Peninsular Siam).

28. *ACANTHOSAURA ARMATA* (Gray).*Acanthosaura crucigera*, Blgr., Cat. Liz. Brit. Mus. 1, p. 302 (1885) ;  
id., Fauna Brit. Ind., Rept., p. 125 (1890) ; id., Rept., Mal. Penin.,  
p. 68 (1912) ; Smith, Jour. Nat. Hist. Soc. Siam, I, p. 154  
(1915).Widely distributed ; common in the southern parts of the  
country in suitable jungle.A series of 19 specimens of this very variable lizard, taken  
recently in the Mountains of Nakon Sritamarat, showed all gradations  
in the length of post-orbital and nuchal spines. The reason for this  
variation was not entirely clear. As one would expect, the spines were  
usually better developed in the male than in the female, and in the  
adult than in the young, but even when these two factors had been  
eliminated there still remained considerable differences to which no  
cause could be assigned. On the evidence of this fine series, taken



from a single locality, *A. crucigera* is no longer tenable as a separate species, but should be united with *A. armata*, which is the older name.

29. *ACANTHOSAURA HORRESCENS* Lönnerberg.

Recently obtained by Count Gyldenstolpe in Northern Siam.

30. *ACANTHOSAURA CAPRA* Günth.

Chantabun (South-eastern Siam).

31. *ACANTHOSAURA CORONATA* Günth.

Chantabun (South-eastern Siam).

32. *CALOTES CRISTATELLUS* (Kuhl).

Peninsular Siam and Western Siam as far north as Sai Yok.

33. *CALOTES FLOWERI* Blgr.

Chantabun (South-eastern Siam).

34. *CALOTES VERSICOLOR* (Daud.)

Common almost everywhere.

35. *CALOTES EMMA* Gray.

Common, and widely distributed. Not found in Bangkok.

36. *CALOTES MYSTACEUS* Dum. & Bib.

Common, and widely distributed; extends into the Peninsula as far south as Bangsaphan, Lat.  $11^{\circ} 13'$ . Not found in Bangkok.

37. *PHYSIGNATHUS MENTAGER* Günth.

South-eastern Siam and the Dong Rek range.

38. *LIOLEPIS BELLIANA* (Gray).

Widely distributed. Usually very common wherever there is sandy soil.

VARANIDÆ.

39. *VARANUS FLAVESCENS* (Gray).

Trang (Peninsular Siam).

40. *VARANUS NEBULOSUS* (Gray).\*

Widely distributed. Not uncommon in evergreen jungle.

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\* Lönnerberg (Results of the Swedish Zoological Expedition to Siam, Band 55, No. 4, p. 8 (1916)), has recorded a species of monitor from Koh Lak, which he considers may possibly be *V. dumerilii* (S. Müll.), owing to the presence of slight keels on the ventral scales, although in other respects, he states, it agrees with *V. nebulosus*. I have examined a number of specimens of *V. nebulosus*, both alive and dead, and have found that many adults show more or less distinct traces of a keel on the ventral scales. It is more evident in preserved specimens than in life.



41. *VARANUS RUDICOLLIS* Gray.

Trang (Peninsular Siam).

42. *VARANUS SALVATOR* (Laur.)

Widely distributed, but not recorded from the North. Common round Bangkok.

## LACERTIDÆ.

43. *TACHYDROMUS SEXLINEATUS* Daud.

Central, Eastern and Peninsular Siam. Found in Bangkok.

## SCINCIDÆ.

44. *MABUIA MACULARIA* (Blyth).

Common, and widely distributed. Rare in Bangkok.

45. *MABUIA MULTIFASCIATA* (Kuhl).

Common, and widely distributed. Common in Bangkok.

46. *MABUIA SIAMENSIS* (Günth.)

Widely distributed, but not as common as the preceding species.

47. *MABUIA LONGICAUDATA* (Hallow).

Siam. (Blgr., Cat. Liz. Brit. Mus., III, p. 189).

48. *MABUIA PRÆSIGNE* (Blgr.).

*Lygosoma præsigne*, Blgr., Ann. and Mag. Nat. Hist. (7), VI, p. 191 (1900); id., Fascic. Malay, Zool. I., p. 159 (1903); id., Journ. Fed. Mal. St. Mus., III, p. 67 (1908); id., Rept. Malay Penin., p. 88 (1912).

The pterygoid bones being entirely separated, and the palatal notch extending forwards as far as a line connecting the centres of the eyes, this species should be placed under *Mabuia* instead of under *Lygosoma* as hitherto, although its affinities, notably the absence of supranasals, are with the latter genus. The evidence for this transfer is based upon specimens obtained last year in the Mountains of Nakon Sritamarat, and now lodged in the British Museum.

49. *LYGOSOMA INDICUM* (Gray).

Hills near Pre (Northern Siam).

50. *LYGOSOMA TERSUM* Smith.

Mountains of Nakon Sritamarat (Peninsular Siam).

51. *LYGOSOMA MACULATUM* (Blyth).

Widely distributed. Very common in some localities. Not found in Bangkok.



52. *LYGOSOMA OLIVACEUM* (Gray).

South-eastern, Western and Peninsular Siam.

53. *LYGOSOMA BOWRINGII* (Günth).

Common, and widely distributed. Rare in Bangkok.

54. *LYGOSOMA HERBERTI* Smith.

Nakon Sritamarat (Peninsular Siam).

55. *LYGOSOMA VITTIGERUM* Blgr.

Widely distributed, but apparently nowhere common.

56. *LYGOSOMA RUPICOLA* Smith.

Chong Kae, Paknambo (Central Siam); Ilin Lap (Eastern Siam).

57. *LYGOSOMA MELANOSTICUM* Blgr.

Chantabun (S. E. Siam); Nakon Sritamarat (Peninsular Siam); and (?) Bangkok (cf. Flower, P.Z.S., 1899, p. 650).

58. *LYGOSOMA LATERALE* (Say).

*Lygosoma reevesii* (Gray), Blgr., Cat. Liz. Brit. Mus., III, p. 264.

Dong Rek Mountains, where it is not uncommon.

*Lygosoma reevesii* from China and Siam, presenting characters indential with *Lygosoma laterale* from North America, cannot be separated from it, and the Asiatic form has therefore been placed by Mr. Boulenger under *laterale*, which is the older name. It is unlikely that this skink has been carried across the Pacific, but considering the close affinities which many members of this large family bear to each other, it is possible that the two forms have been produced independently.

59. *LYGOSOMA QUADRIVITTATUM* Peters.

Patani (Peninsular Siam).

60. *LYGOSOMA CHALCIDES* (Linn.).

Widely distributed. Not uncommon in Bangkok.

61. *LYGOSOMA ISODACTYLUM* (Günth.).

From Ayuthia to Paknambo (Central Siam), following the railway line.

62. *LYGOSOMA ANGUINOIDES* Blgr.

Bangsaphan (South-western Siam); Maprit (Peninsular Siam).

63. *TROPIDOPHORUS YUNNANENSIS* Blgr.

Khao Pleung and Muang Song forest, Pre, (Northern Siam.)

64. *TROPIDOPHORUS COCHINCHINENSIS* (Dum. & Bib.).

Khao Sebab, Chantabun (South-eastern Siam).



65. *ISOPACHYS GYLDENSTOLPEI* Lönnerberg.  
Koh Lak and Hua Hin (South-western Siam).

DIBAMIDÆ.

66. *DIBAMUS NOVÆ-GUINÆÆ* Dum. and Bib.  
Patani (Peninsular Siam).



## SOME ADDITIONS TO THE SIAMESE AVIFAUNA.

By E. G. HERBERT, F. Z. S.

I wish to record the following birds as having been recently obtained in Siam, and which have not, I believe, been previously recorded from this country. In doing so, I desire to acknowledge the assistance that has been given me by Mr. Herbert C. Robinson, C.M.Z.S., M.B.O.U., Director of Museums, and Mr. C. Boden Kloss, F.Z.S., M.B.O.U., Asst. Director of Museums, Federated Malay States, in the identification of most of these birds.

Some notes on these and other species obtained by my collector will appear in a later number of this Journal.

1. STACHYRIS POLIOGASTER. The Ashy-bellied Small Babbler.
2. IOLE MALACCENSIS. The Streaked Bulbul.
3. HEMICHELIDON FERRUGINEA. The Ferruginous Flycatcher.
4. CYORNIS UNICOLOR. The Pale Blue Flycatcher.
5. XANTHOPYGIA XANTHOPYGIA. The Yellow-bellied Flycatcher.
6. CALLOLOPHUS MALACCENSIS. The Banded Red Woodpecker.
7. GAUROPICOIDES RAFFLESII. Raffles' Three-toed Woodpecker.
8. PYROTROGON DIARDI NEGLECTUS. The Claret-headed Trogon.
9. SYRNIUM INDRANI. The Brown Wood-Owl.
10. BUBO COROMANDUS KLOSSI. Kloss' Dusky Horned Owl.
11. SPIZÆTUS ALBINIGER. Blyth's Hawk-Eagle.
12. RHIZOTHERA LONGIROSTRIS. The Long-billed Jungle-Partridge.
13. GLAREOLA LACTEA. The Small Indian Pratincole.
14. BOTAURUS STELLARIS. The Bittern. Shot by Mr. G. F. Weston Elwes at Raheng.



**A LIST OF BIRDS NOT PREVIOUSLY RECORDED FROM SIAM,  
WITH NOTES.**

By W. J. F. WILLIAMSON, M. B. O. U.

The following birds are, I believe, new records for Siam, and include a number obtained by Mr. C. J. Aagaard and other gentlemen whose names are given below.

I have again to express my obligations to Messrs. H. C. Robinson and C. Boden Kloss for kindly examining and identifying some of the birds regarding which I was doubtful.

1. *MALACOCINCLA SEPIARIA TARDINATA*. Hartert's Babbler.

1 ♀ obtained by Mr. C. J. Aagaard at Baugnara, Peninsular Siam, on 3rd November 1915. This bird has been recently described by Hartert (Bull. Brit. Orn. Club, No. CCXI, p. 35, Dec. 1915) and is the one formerly known as *Turdinus sepiarius*.

2. *GARRULAX MOUHOTII*. Mouhot's Laughing-Thrush.

2 ♂ procured by my collector at Pak Jong, Dong Rek range, Eastern Siam, on 8th June 1916.

3. *GYPHOPHILA CRISPIFRONS*. The Lime-rock Babbler.

1 ♂ 2 ♀, of what appear to be young birds of the year (Oates, Faun. Brit. Ind. Birds, I (1889), p. 150), were procured by my collector in April 1916 in the Muang Song forest, Prae, Northern Siam.

4. *IOLE VIRESCENS*. The Olive-green Bulbul.

1 ♀ obtained by my collector at Hup-bon, east of Sriracha, S. E. Siam on 25th July 1915. This bird is the northern form of the Malayan *Iole olivacea*, The Olive Bulbul.

5. *PYCNONOTUS PUSILLUS*. The Small Olive Bulbul.

Obtained by Mr. C. J. Aagaard at Baugnara, Peninsular Siam, in October 1915.

6. *BURNESIA (PRINIA) FLAVIVENTRIS*. The Yellow-bellied Wren-Warbler.

I found this bird common, in April 1916, in the high grass of the extensive clearings caused by timber-felling operations at



Muak-lek, Dong Rek range, Eastern Siam. According to Oates (Faun. Brit. Ind. Birds, I (1889), p. 449) this species "frequents swamps, the banks of rivers and canals, and grassy plains which are liable to inundation," but this description of its habitat does not apply to the locality where I obtained it. Muak-lek is situated in a broad, flat valley, some 800 ft. above sea-level, and although the valley is intersected by a stream, the latter flows mostly between high banks, densely covered with trees, and the grassy portions of the valley are not, I should say, subject to inundation.

7. *HEMIPUS OBSCURUS*. The Malayan Pied Shrike.

1 ♂ obtained by Mr. C. J. Aagaard at Bangnara, Peninsular Siam, on 9th May 1915.

8. *CAMPOPHAGA TERAT*. The Pied Cuckoo-Shrike.

First obtained by Mr. J. J. McBeth in July 1914 at Singora, Peninsular Siam, flying about in small flocks among the Casuarina trees on the sea-shore. It has since been also found by Mr. C. J. Aagaard and my collector at Bangnara, Peninsular Siam.

9. *ALAUDA GULGULA SALA*. The Formosan Sky-Lark.

This is the bird which I have previously (Journ. Nat. Hist. Soc. Siam, I (1915), p. 198) recorded in error as *Anthus striolatus*. The mistake was detected by Mr. E. C. Stuart Baker, F. Z. S., M. B. O. U., when he was looking over my birds last year at the British Museum. The specimens have also been since examined by Dr. E. Hartert, M. B. O. U., who writes to me as follows:—"It seemed hardly conceivable that the true *A. g. sala*, which has only been found on Formosa and South Hainan, should also be found in Siam, though it must be admitted that we do not fully know if it is found in Cochin China, etc., but in S. China it is represented by *A. g. coelirox*. I have, however, carefully compared your Siamese skins with the true *A. g. sala* in the British and Tring Museums, and must admit that there are no tangible differences between them; all I can see is that the stripes on the chest in *nearly* all your specimens from Siam are slightly narrower, while the beak in some, or I may say *most*, of your examples is somewhat thicker. The breast and sides of the body in the Siamese birds are slightly more tinged with vinous buff. There is no difference in size. I measure the wings as follows:—



Typical *A. g. sala*: Wing 85-92 mm.

Siamese examples: „ 85-90.5 mm.

“I leave it to you, if you think it worth while, to name the Siamese form on account of its narrower chest-stripes and generally thicker bill.”

Dr. Hartert concludes by asking for further specimens, including autumn ones. These I have not yet had the opportunity of procuring. In the meantime, therefore, the bird remains under the name of *A. g. sala*, though it may be of interest to mention that, when Mr. E. C. Stuart Baker was examining my specimens, he was struck with their sharply acuminate tail-feathers. In this respect the birds differ from the Indian *A. gulgula*, but I am not certain whether the typical *A. g. sala* has this characteristic.

I may add that the bird is common in the fields round Bangkok, which is the only locality from which I have procured it.

10. *CHRYSOBLEGMA PIERREI*. Pierre's Yellow-naped Woodpecker.

A single specimen (♂) obtained by my collector at Pak Jong Dong Rek Hills, Eastern Siam, on 8th June 1916. Mr. H. C. Robinson informs me that, so far as he is aware, this species is only known from the typical series from Cochin China, in the Paris Museum.

11. *HYPOPICUS HYPERYTHRUS*. The Rufous-bellied Pied Woodpecker.

1 ♂ procured by Mr. E. W. Trotter from Me-maw, Lam-pang, Northern Siam, on 4th October 1915.

12. *HIEROCOCCYX VARIUS*. The Common Hawk-Cuckoo.

1 ♀ shot by Mr. C. J. Aagaard at Hua Hin, on the southwestern side of Central Siam, on 14th April 1914. Identified by Mr. A. Christiani, of Copenhagen.\*

13. *MYRISTICIVORA BICOLOR*. The Pied Imperial Pigeon.

H. R. H. Prince Chumpon obtained a specimen (which I have seen) on the mainland of Chumpon Bay, Peninsular Siam, in May 1915. The Prince informs me it was a solitary specimen.

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\* According to Blanford (Faun Brit. Ind., III, p 214), this reported occurrence is too far East for the true range of this bird.



14. *LIMOSA NOVAE-ZEALANDIÆ*.

A pair (♂ and ♀) of this species of Godwit was procured by Mr. C. J. Aagaard at Chaya, near Bandon, Peninsular Siam, on 15th June 1912, and has been identified by Mr. A. Christiani, of Copenhagen.

15. *LIMOSA MELANUROIDES*. The Black-tailed Godwit.

Mr. C. J. Aagaard obtained a specimen (♂) on Koh Khwai, an island in the Inner Gulf of Siam, on 30th November, 1911. The bird was identified by Mr. A. Christiani, of Copenhagen.

16. *MACRORHAMPHUS TACZANOWSKII*. The Snipe-billed Godwit.

Mr. C. J. Aagaard obtained a specimen (♂) of this rare bird on the mud-flats near the mouth of the Lakon river, in Peninsular Siam, on 1st September 1911. It was identified by Mr. A. Christiani, of Copenhagen.

17. *TOTANUS STAGNATILIS*. The Marsh Sandpiper.

What appears to be the earliest recorded specimen was one shot by Mr C. J. Aagaard at Bang Boon, near Bangkok, on 17th March 1912. I have also since obtained the bird near Tachin and at Bangplasoi (both of them localities not far from Bangkok), in March 1916.

Mr. C. Boden Kloss informs me that the record of this bird from Langkawi, Kedah, at that time in Siam (Ibis, 1911, p. 13) was an error for *Rhyacophilus glareola*, The Wood Sandpiper.

18. *TRINGA SUBARQUATA*. The Curlew Stint.

Recorded by Mr. C. J. Aagaard from Lakon, Peninsular Siam, on dates ranging between 1st August and 16th May, 1911-12 also from Chaya, near Bandon, Peninsular Siam, on 16th June 1912. The last mentioned date is a very late one for the occurrence of this bird in Southern Asia. Blanford (Faun. Brit. India Birds, IV (1898) p. 279) states that it leaves in May for its breeding haunts in the far North.

Messrs Robinson and Kloss have recorded this bird from Kuala Kedah in November 1907, *vide* 'Ibis' 1911, p. 14. As Kedah passed out of Siamese jurisdiction in 1909, the present record is worth making.

19. *STERNA ANGLICA*. The Gull-billed Tern.

I obtained a pair of these birds (1 ♂ ad., 1 ♀ imm.) at Bangplasoi, C. Siam, at the head of the Gulf, on 19th March 1916.



There is a specimen of this Tern in the British Museum from the Pakchan Estuary. As the Pakchan river, in its lower reaches, forms the boundary between Siamese and British territory, a bird obtained in the Estuary of that river cannot, I think, be claimed as a definite Siamese record, which the present one is.

20. *STERNA ANÆSTHETA*. The Panayan Tern.

On the 27th June 1916 my collector obtained a specimen of this bird on a rocky islet near Koh Phai, Inner Gulf of Siam, together with examples of *S. melanauchen* (The Black-naped Tern) and *S. bergii* (The Large Crested Tern), as well as numerous eggs apparently belonging to the two first-named species. He also brought with him some eggs of *S. bergii*, obtained by Mr. C. H. Forty on a similar islet on 15th June, and kindly sent up to me by that gentleman. Subsequently, in company with Mr. Forty, I visited these islets, as well as some others near Koh Rin, a little further south, on the 17th and 18th July, and procured several more examples of all three Terns. *S. anæsthetic* and *S. melanauchen* were particularly numerous near Koh Rin. The few eggs we found were mostly addled, but two chicks were observed, trying to escape notice by snuggling away in crevices of the rocks, with their bills and heads wedged in as far as possible!

It may be of interest to note here that, on the occasion last mentioned, we obtained a beautiful specimen (one of a pair) of *Sterna dougalli* (The Roseate Tern), with the delicate, almost invisible, pink suffusion on the white of the under-parts. The only other record of this bird from Siam, of which I am aware, is that by Mr. H. C. Robinson from Koh Samui and Koh Pennan, Peninsular Siam (Journ. Fed. Malay States Mus., V. (1915), p. 142), but I believe it is not uncommon—at all events at certain seasons—at the head of the Gulf of Siam. I have, on more than one occasion, when crossing the bar of the Chao Phraya river outward bound from Bangkok, observed small white Terns, with red bills and feet, which I believe to be of this species, following the steamer. On every such occasion they have dropped off after a few miles—a circumstance probably accounted for by the fact that this bird, although a sea Tern, is a coastal form.

21. *SULA SULA*. The Booby or Brown Gannet.

When visiting the islets near Koh Rin, Inner Gulf



of Siam, on 18th July 1916, as mentioned above, one of our party picked up a sun-dried specimen of this bird on the shingly beach at the foot of the rocks. It was in an excellent state of preservation, and could not have been dead many weeks.

In connection with this record, it is necessary to remark that Messrs. Robinson and Kloss have reported (*Ibis*, 1911, p. 19), that they found the Booby "numerous off Langkawi in November 1907." The Langkawi islands, situated off the western coast of the Malay Peninsula, passed under the protection of Great Britain in 1909, together with the adjacent mainland State of Kedah, but they were Siamese territory at the time above mentioned. The present record is, however, a new one, so far as existing Siamese territory is concerned, and interest is added to it by reason of the considerable extension of range since the Langkawi occurrence was noted.

22. *SPATULA CLYPEATA*. The Shoveller.

Mr. A. H. Duke shot a drake in non-breeding-plumage (*i. e.*, with the head and upper neck brown instead of glossy green) on 22nd January 1916 at Klong Luang Peng, about 30 miles east of Bangkok, Central Siam.

This duck is probably rare in Siam. Its distribution is given by Blanford (*Faun. Brit. Ind., Birds*, IV (1898), p. 453) as "throughout the greater part of the Northern Hemisphere, between lat.  $10^{\circ}$  and lat.  $68^{\circ}$  N., breeding in the north temperate zone. A winter visitor to India, Ceylon and Northern Burma." He adds that "it is found in Assam, Manipur and the Upper Irrawaddy Valley above Myingyan; but not, so far as is hitherto known, in Pegu or Tenasserim."

The Southernmost limit above given ( $10^{\circ}$  N. lat.) is approximately that of the Isthmus of Kra, but a specimen of the Shoveller is recorded (Robinson, *Hand-list Birds Mal. Peninsula* (1910), p. 5), as having been shot near Kuala Lumpur, Federated Malay States (about  $7^{\circ}$  further south) in 1898. This was doubtless a straggler, as Mr. Robinson informs me that no further specimens have been obtained in Malayan limits.

Bangkok is in about the latitude of Central Tenasserim, while Pegu lies roughly between the same parallels as Northern Siam. It thus appears that the greater part of this country, though within the



limits of the range of distribution of the Shoveller, lies somewhat too far south to permit of this duck being regarded as a regular visitor.

It is to be hoped that sportsmen in Siam will carefully note and report any future occurrences of this bird.





## MISCELLANEOUS NOTES.

## No. I. The Porcupine of Tenasserim and Southern Siam.

BY OLDFIELD THOMAS, F. Z. S.

[From The Annals and Magazine of Natural History, Series 8, Vol. 17, No. 97, January 1916, pp. 136-139].

The National Museum owes to Mr. C. Boden Kloss a first typical set of the fine collection of mammals from S.E. Siam, of which he has been giving an account to the Zoological Society. Among these there is a Porcupine, which for want of material for comparison he has asked me to work out for him, and I have at the same time examined the other specimens that the Museum contains from the same region.

Porcupines from the Burma-Siam area have been sometimes referred to *Acanthion brachyurus*, Linn., and sometimes to *A. bengalensis*, Blyth, the latter being unfortunately an animal of which no one seems to have modern specimens available for comparison.

In his original account Blyth says of it "general colour as in *A. hodgsoni*; the quills generally having the basal half white, the rest black, most of them with a white tip more or less developed." This description no one would apply to the more southern animal under notice, for in them the black ring on the quills is in length only from one-third to one-fifth of the white tip, whereas Blyth's account obviously suggests that the greater part of the terminal half of the quill is black, and only just the tip white. This latter condition is found in *A. hodgsoni*, and would fulfil his statement as to the general colour. Possibly, indeed, *bengalensis* is not distinct from *hodgsoni*, but this must be settled later.

*A. bengalensis* being thus eliminated, all the porcupines in question—those of Burma, Siam, and the Malay Peninsula—are practically identical externally, with a small brown and white crest, greater than in *hodgsoni*, far smaller than in *leucurus*, and have the main body-spines buffy white, with a median blackish ring. The nuchal crest is rather less developed in the Malay animal, but the difference is not great.

In the skulls, however, I find that two forms are readily distinguishable—the one from the Malay Peninsula (true *brachyurus*) and the other from Tenasserim and Siam. These may be diagnosed as follows:—

## ACANTHION BRACHYURUS, Linn.

Syn. *A. grotei*, Gray †.

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† It is useless to try and allocate Gray's names *flamingi* and *bartletti*, based on specimens of doubtful locality and asserted to be menagerie hybrids.



Size smaller, condylo-incisive length less than 130 mm. (see table of measurements on p. 68). Nasals comparatively small and frontals correspondingly large, the length of the frontal suture over 55 per cent. of that of the nasals. Supraorbital edges tending to the development of a fairly definite postorbital process. Size of teeth and other proportions as indicated by the measurements.

A good figure of the skull of this porcupine has been given by Bonhote ‡.

*Hab.* Malay Peninsula. Type-locality and also that of *A. grotei*, Gray—Malacca. Good skulls examined from Mabek, Jalor (*Robinson and Annandale*), Malacca (*Cantor*), and Singapore (*Ridley*).

#### ACANTHION KLOSSI, sp. n.

Size larger, well-developed skulls attaining a condylo-incisive length of 140 mm. Nasals large, their length more than twice that of the comparatively short frontal suture. Interorbital region broad, swollen, convex, with scarcely any indication of a postorbital projection.

Skull-measurements in table on p. 68.

*Hab.* Southern Tenasserim and Southern Siam. Type from Tenasserim Town, other specimens from Bankachon, Tenasserim (*Shortridge*), S. Siam, 12° N., 99° 50' E. (*K. G. Gairdner*) and Klong-Yai, S.E. Siam (*C. Boden Kloss*).

*Type.* Adult male. B.M. no. 14. 12. 8. 223. Original number 4905. Collected by G. C. Shortridge. Presented to the National Collection by the Bombay Natural History Society.

This species is distinguished from *A. brachyurus* by its shorter frontals and longer nasals and the lesser development of postorbital processes.

I have named the species in honour of Mr. Kloss, who noticed and drew my attention to its difference from *A. brachyurus*, and himself collected the specimen from S.E. Siam.

Anderson's *Hystrix yunnanensis* has markedly shorter nasals than any of the porcupines here referred to.

The Chinese porcupine, *Acanthion suberistatus*, Swinh., has a skull very like that of *A. klossi*, but its coloration appears to be more as in *A. bengalensis* and *hodysoni*.

#### No. II. A new Binturong from Siam.

By OLDFIELD THOMAS, F. Z. S.

[From the Annals and Magazine of Natural History, Series 8, Vol. 17, No. 99, March 1916. p. 270]

Among a collection of mammals from South-western Siam presented last year to the National Museum by Mr. K. G. Gairdner there occurs a fine binturong's skull, so conspicuously larger than any

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‡ Fascic. Malay. I. pl. iii. (1903).



## Cranial Measurements.

	Upper length.	Condyllo-incisive length.	Nasals, length.	Nasals, breadth.	Frontal suture.	Percentage of frontal to nasal length.	Interorbital breadth.	Upper tooth-row.
<i>A. brachyurus.</i>								
Mabek, Malay Peninsula.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
♂	141	129	60	26	40	67	48	24
♀	...	...	...	...	...	...	...	...
" " "	137	128	62	32	35	56	48	27
♂	130	123	60	25.5	35	58	44	...
Prov. Wellesly.	...	...	...	...	...	...	...	...
Singapore...	128	121	...	31	36	...	48	26.5
<i>A. klossi.</i>								
Tenasserim.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Type, ♂	147	140	74	40	35	46	54	31
♂	...	...	...	...	...	...	...	...
" " "	141	136	78	42	30	38	54	30
S.E. Siam. ♂	139	130	71	36	30	42	49	29.5
S. Siam ...	122	132	71	37.5	28	40	49	28.5



other known that it evidently represents a distinct species. I have, however, not been able to describe it before, owing to a doubt as to what sexual variation there might be in the genus and the fact that all our adult skulls appeared to be those of females. Now, however, thanks to the kindness of Mr. H. C. Robinson, I have before me a fine male skull from Bukit Gautang, Perak, and am thus able to make a proper comparison with the Siamese animal. This latter may be called

*ARCTICTIS GAIRDNERI*, sp. n.

Size conspicuously greater than in the other species. Skull broader, more vaulted. Nasals very broad, parallel-sided to the point where they join the frontals laterally, instead of evenly narrowing from front to back. Frontal region broad, much swollen upwards and laterally, then abruptly narrowed at the fronto-parietal suture. Sagittal and lambdoid crests greatly developed. Posterior palate broad, much produced backwards. Bullæ narrow, far overlapped by the heavy paroccipital processes. Teeth much worn down in the type, their proportions apparently about as in the Perak skull.

Dimensions of the type (those of the Perak male in brackets):—

Greatest length 153 mm. (136); condylo-basal length 152 (136); zygomatic breadth 98 (84.5); nasals, mesial length 28 (21), breadth at middle 19 (12); interorbital breadth 41 (33); tip to tip of postorbital processes 59 (47.5); breadth immediately behind the latter 51.5 (40); breadth at fronto-parietal suture 41 (39); greatest posterior breadth on ridges 73.5 (59); height of crown from posterior palate 54.5 (47); palatal length 84.5 (73); breadth of posterior palate 24.5 (19.7).

*Hab.* Sai Yoke, S.W. Siam, near Tenasserim boundary.

*Type.* Adult skull (no doubt male) without skin. B.M. No. 15. 12. 1. 26. Original number 207. Collected and presented by Mr. K. G. Gairdner.

This binturong differs so immensely in size from the ordinary *Arctictis* that no detailed comparison is needed in describing it as new. It affords a curious parallel to the giant *Arctonyx* of the same region—*A. dictator*—discovered by Mr. Robinson, which was also obtained by Mr. Gairdner at Sai Yoke.

I have much pleasure in connecting this fine species with the name of its discoverer, who has been making great efforts to improve our knowledge of the Siamese mammal fauna. It is to be hoped that he may presently be able to obtain a complete specimen of *Arctictis gairdneri*.

[CORRECTION.—The above article renders it necessary to make the following corrections in Vol. I, No. 4 of this Journal:—Page 252, for *Arctictis binturong* read *Arctictis gairdneri* Thos. and p. 253 for *Arctonyx collaris* read *Arctonyx dictator* Thos. Eds.]



### No. III. Two new Bush-Larks from Siam.

By E. C. STUART BAKER, F. Z. S., F. L. S., M. B. O. U.

WITH NOTE BY W. J. F. WILLIAMSON, M. B. O. U.

[From the *Bulletin of the British Ornithologists' Club*, No. CCX (1915), pp. 9 and 10 ]

Mr. E. C. Stuart Baker exhibited specimens of a new subspecies of Lark, which he proposed to call :—

MIRAFRA CANTILLANS WILLIAMSONI, subsp. nov.

He made the following remarks :—

“The subspecies of Lark which I now exhibit I propose to name after Mr. W. J. F. Williamson, who discovered it at Bangkok, Siam, where it is said to be common. It is nearest, not to typical *M. cantillans* from West and Central India, but to *M. philippensis* from Manila and the Philippines.

“From *M. cantillans* it differs in being much smaller, with a wing varying between 68 and 73 mm. as against 73 to 82 mm. in that bird. The upper surface is very much darker and the lower surface also decidedly so. In *Mirafra cantillans cantillans* the general tone of the upper plumage is a rufous sandy, the pale edges of the feathers dominating the dark centres; in *M. c. williamsoni* the general aspect of the back is dark brown, the edges to the feathers being much narrower and grey or grey-brown in tint.

From *M. c. philippensis* it differs in being rather paler and less black above and in being decidedly darker and duller in tint below. Every specimen in the series also shows some rufous on the breast and flanks which is never present in *M. c. philippensis*, and there are also fewer black markings on the breast and lower throat than there are in that bird.

“The types of the new subspecies are :—

♂ . 31.3.15. Bangkok.

♀ . 19.4.15. Bangkok.

which Mr. Williamson is presenting to the British Museum, together with others.

“I also exhibit a series of eggs of this subspecies taken by Mr. Williamson round about Bangkok.”

[On page 197, vol. I (1915) of this Journal, I mentioned that I had submitted a number of specimens of a Bush-Lark, common round Bangkok, to Mr. H. C. Robinson, C. M. Z. S., M. B. O. U., for opinion, and that he had advised me, pending the examination of a series at the British Museum, to refrain from assigning to it any definite specific name.

Acting on this advice, I took a large series to England with me last year, and the bird has been accorded new subspecific rank as above.



This bird is a common Bangkok resident, being found in the open fields and along the road-sides of the suburbs, and is known to the Siamese as นกกระชับ, Nok krachab fon. W. J. F. W.]

[From the *Bulletin of the British Ornithologists' Club*, No. CCXI. Vol. XXXVI (1915), p. 34].

Mr. E. C. Stuart Baker exhibited two specimens of a new subspecies of *Mirafra*, for which he proposed the name:—

MIRAFRA ASSAMICA MARIONAE, subsp. nov.

He made the following observations:—

"The interesting specimens shown form a link between *Mirafra assamica* and *Mirafra microptera*, resembling the former most nearly in coloration and the latter in size.

"From *M. assamica* it also differs in being more brown and less grey above and paler below, whilst from *M. microptera* it differs in being grey-brown rather than rufous-brown or sandy brown and, generally, much darker. It has the same ill-defined nuchal markings as are to be found in *M. microptera*, but these are whitish instead of rufescent. The wing averages about 75.0 mm. or about the same as in *M. microptera* as against a full 84 mm. in *M. assamica*.

"I name this new Lark after Mrs. Marion Williamson, who obtained the specimens.

"The types are:—

♂. Ayuthia, Central Siam, 8.7.14.

♀.

"These two skins, which are those of a pair killed by the same shot, have been presented to the Museum by Mr. Williamson."

#### No. IV. The Giant Ibis (*Thaumatibis gigantea*).

The accompanying illustration is reproduced from a photograph of a specimen of this rare Ibis which was obtained by Mr. K. G. Gairdner at Ban Tup Takoh, near Chom Beung, Rathuri, in March 1913. The bird is now preserved at the British Museum (Natural History) where the photograph was taken, for this Journal, by the courtesy of the Museum authorities.

As stated by Robinson and Kloss (Ibis 1911, p. 17), the type specimen was procured by Oustalet in Cochin China, while Abbott obtained a second one in the interior of Trang, in Peninsular Siam, where also Robinson and Kloss procured one in February 1910. Mr. Gairdner's is thus the fourth known specimen, and he sends me the following interesting note on it:—

"It may be of some value to record the measurements of this specimen and also the colours of the soft parts two hours after death:—Length 38.5 inches; wing 21.5; tail 10; tarsus 4.3; bill to gape 8.5; bend of wing to top of head 9.



"Head and upper half of neck, naked, grey, but black in the folds; eye crimson; beak horn, half legs, tarsi and toes crimson. Sex uncertain, but believed to be a male.

"I think there is probably a seasonal or sexual difference in the colouration of the bare head, for I find that in 1910 I sent the following description of an Ibis to the British Museum, which identified the particulars as agreeing with this species.

"Observed at Sarahett on the Petchaburi river in April 1910 at about 50 yards distance, an Ibis, general colour dark brown, back of head blue and probably naked. Beak probably 8 inches, or same as head and neck. Was the size of a small pea-hen, and had the same hump back. Has a quicker, more feverish walk and flight than most waders or swamp birds. Only one seen, and frequenting the same ground as Pond Herons and White Necked Storks.' I think that since I was near enough to get the length of the beak correct, probably the colour of the back of the head was also correct.

"The photo depicts the bird standing in a wide space, but as previously mentioned in this Journal (Vol. I., p. 39) the species haunts small swampy glades surrounded by tree jungle, and in 1913 I put up a pair from a grassy bank beside a small stream in 'Pa Teng Rang' (Lao, 'Pa paa'), or jungle mostly of a species of *Shorea* near Ban Tup Takoh, Ratburi."

W.-J. F. WILLIAMSON.

Bangkok, May 1916.

#### No. V. Occurrence of the Barred Ground-Dove (*Geopelia striata*) in Siam.

In Vol. IV of the *Fauna of British India, Birds*, which appeared in 1898, this Dove is said (p. 52) to be found in the Malay Peninsula and Archipelago to the Philippines and Celebes, and to range into the extreme south of Tenasserim, but no mention is made of its occurrence in Siam. This, at first sight, is somewhat strange, as there are five skins of the bird in the British Museum, from Siam, which I have lately had the opportunity of examining, and all of them are of very old date. Three were collected in 1879 by Davison in Tongkah, i. e., Puket, the fourth by Darling in the same year at Ta-rua (also in Puket), while the fifth is from the Gould collection and is labelled "Siam (Schomburgh)" without any date. With the exception of the last specimen, however, which may have been overlooked it is probable that the localities where the others were obtained were not recognised as Siamese.

On the other hand, Ogilvie-Grant in his Report on the Birds collected by Messrs. Annandale and Robinson in Perak and the Siamese Malay States<sup>1</sup> published in 1905, records two specimens of the Barred Ground-Dove from the Province of

1. (Fasc. Malay., III, p. 121).





*Thaumatibis Gigantea. The Giant Ibis.*







Patani, in the extreme southern portion of what is now known as Peninsular Siam. Since then there appear to have been no further records from this country, with the exception of the entry in my Preliminary List of Bangkok Birds (Vol. I, No. 1, p. 47 of this *Journal*, 1914), despite the not inconsiderable collections made by Messrs. Robinson and Kloss in Trang, Peninsular Siam<sup>1</sup>, by Count Gyldenstolpe, mainly in Central, Eastern and Northern Siam<sup>2</sup>, by Mr. H. C. Robinson in Bandon, Koh Samui and Koh Pennan, Peninsular Siam<sup>3</sup>, and again by Mr. C. Boden Kloss in Southern-eastern Siam<sup>5</sup>. Mention ought also, perhaps, to be made here of the fact that Stuart-Baker<sup>4</sup> remarks that the Barred Ground-Dove is "found in Siam, but is apparently rare there, and was never met with by Count Gyldenstolpe during his expedition in 1911-12."

In view of the above facts, it may be worth while recording that this species is fairly common in Bangkok, and is often to be seen in our gardens, walking quietly about on the ground, singly or in pairs, or perched on a tree. Its ordinary note is a *Ku-kuru ku-ku-ku-ku*, always uttered from a perch, so far as I have observed, and it is frequently caught in a cage-trap containing a decoy bird, which attracts the wild ones by its call. Hundreds of this gentle little Dove are also to be seen in the bird-shops of Bangkok (imported from Singapore), and there appears to be little doubt that, although it is now well-established here and breeds freely (I have taken its eggs in February and June), it is an introduced species, so far as this part of Siam is concerned. The fact of the bird being known to the Siamese as

นกเขาสีเทา (*Nok-khao-Ch'hara*), *i e*, the Javanese Dove, also appears to confirm the conjecture as to its foreign origin. Patani and Phuket are, of course, well within its range, as they are both south of the Isthmus of Kra (10° 30' N. Lat.), but if the bird extends into the south of Tenasserim, it ought also to be found in the northern portion of Peninsular Siam, as far as Chumpon, which is in the same latitude as Kra. It is rather surprising, therefore, that Messrs. Robinson and Kloss did not meet with it either in Trang or in Bandon, which are much further south.

W. J. F. WILLIAMSON.

Bangkok, 24th June 1916.

1. *Ibis*, 1910, pp. 559-675, and 1911, pp. 10-80.

2. *Kungl. Svenska Vetenskapsakademiens Handlingar*. Band 50, No. 8, 1913.

3. *Journ. Fed. Malay States Mus.*, Vol. V., No. 3 (1915), pp. 83-110 and 139-150.

4. *Indian pigeons and Doves*, 1913 p. 254.

5. *Ibis*, 1915, pp. 718-761.



**No. VI. Mummified specimen of Malay House-Swift**  
*(Cypselus subfurcatus).*

On the 1st instant I visited Koh Luan, a small island near Koh Phai, in the Inner Gulf of Siam, for the purpose of collecting the eggs of certain sea-birds which were breeding on a small patch of rocks at the end of the island and separated from it by the sea. In the roof of a cave, 20 ft. from the ground, was a cluster of three nests of the Malay House-Swift, composed of flotsam, weeds and moss, and old fragments of fishing line. Hanging from the nest was a bird, stiff and dried, and the cause of death was obvious, as one of the bird's legs was entangled in a thread, the other end of which was firmly embedded in the materials of which the nest was composed.

I surmise that; the patch of rocks being practically free of destructive insect life, the air of the cave (the roof of which, having fallen in, allowed the sun to enter) caused the body of the bird to dry up rapidly.

The bird has been identified by Mr. W. J. F. Williamson.

C. H. FORTY.

Bangkok, June 1916.

**No. VII. Some new Lepidoptera from Siam.**

By LORD ROTHSCHILD, F.R.S., PH. D.

WITH NOTE BY E. J. GODFREY, F.E.S.

[From Annals and Magazine of Natural History, Series 8, Vol. 17, No. 102, June 1916, p. 474.]

The two Siamese AMATHUSIDÆ were collected by Mr. Godfrey of Bangkok, who has presented the *Stichophthalma* to the British Museum.

RHOPALOCERA.

STICHOPTHALMA GODFREYI, sp. n.

♂. This very distinct species is nearest to *St. cambodia*, Hew.

*Upper surface*.—Head brownish rufous; antennæ rufous; thorax and abdomen greyish brown, abdomen washed with blackish. Fore wing: basal half greenish steel-blue washed with olive-brown on costal area and from the base distad; outer half greenish white or white tinged with Nile-green; terminal band, apex, and submarginal row of large excised patches black-brown washed with steel-blue; a post-median band of dark greenish steel-blue chevrons joined into a chain-like band. Hind wing similar, only the submarginal band of excised patches is replaced by a second row of chevrons and the white ground of the outer half of the wing is strongly suffused with greenish lavender-blue. Underside very similar to that of *cambodia*, but much



darker; all the lines and other markings much sharper and the double submarginal bands deep brown.

Length of fore wing 72 mm., expanse 151 mm.

*Hab.* Siam (near Kanburi, 8.5. 1914).

*THAURIA LATHYI SIAMENSIS*, subsp. n.

In Seitz's 'Macrolepidoptera of the World,' Herr Fruhstorfer has treated the four forms of *Thauria*, known to him, as SUBSPECIES of one species, *Thauria aliris*, Westw.—at the same time remarking that his *lathyi* was almost worthy of specific rank, as it lacked the conspicuous tuft of androconial hairs in the cell of the hind wings.

The Tring Museum possesses, however, from the Tenasserim Valley and Toungoo, Burmah, both typical *Th. a. pseudaliris*, with very narrow, yellow, oblique band on the fore wings and large cellular androconial tuft on hind wings, and also a form of *lathyi* with large whitish-cream oblique bands on fore wing and no cellular androconia on hind wing (described below). From Perak there are also in the Tring Museum a large series (9 ♂♂, 3 ♀♀) of *a. pseudaliris* and 2 ♀♀ of the form of *lathyi* described below. This proves that *lathyi* occurs side by side with *a. pseudaliris* and that it is a quite distinct species.

♂. Differs from *l. lathyi* in being much smaller, basal one-third of fore wing is suffused with much deeper, more maroon rufous, and the oblique pale band of fore wing is considerably wider and pure white.

Length of fore wing 50 mm., expanse 106 mm. : *l. siamensis*.

Length of fore wing 53 mm., expanse 112 mm. : *l. lathyi*.

*Hab.* Siam (Hup Bon, 26.4.1914).

[The specimen of *Stichophthalma godfreyi* upon which Lord Rothschild based his description was obtained by Mr. K. G. Gairdner, in May 1914, in dense evergreen forest, about 40 miles N. W. of Kanburi (wrongly spelt Kambusi in the original description), and some 4 miles from the Tenasserim boundary. I obtained a second specimen at Hup Bon, in the Sriracha forest in May 1915 and four more from Khao Sebab, Chantabun, in March 1916.

This very handsome butterfly is found only in dense jungle. Dr. Smith, with whom my collector was working on Khao Sebab, informs me it was by no means uncommon there. Numbers of them were seen along the gravelly bed of a small stream at the foot of the hill, and they were met with at all elevations up to 2000 feet, but owing to their erratic flight, and the impossibility of following them in the jungle, were most difficult to obtain.

*Thauria lathyi siamensis* is not uncommon in the forest around Hup Bon (wrongly spelt Hoophok in the original description), but I have not found it elsewhere in Siam. It is also an extremely difficult butterfly to catch. Its home is in the thickets of the densest jungle, and it seldom ventures into the open. It is, however, attracted by fallen and rotting fruit, and nearly all my specimens were taken at baits of over-ripe bananas, placed in shady jungle paths. E. J. G.]







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ON SOME SIAMESE MAMMALS.

ERRATA.

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- P. 150, line 2. After "shell" read "215."  
P. 156, line 6. For "Bai" read "Bang Lai."  
P. 157, line 33. For "Kang" read "Klong Bang."  
P. 162, under "CALAMARIA VERMIFORMIS" read "Bangnara,  
Patani, 2 specimens."  
P. 163, under "AMBYCEPHALUS CARINATUS" read "Bang-  
nara, Patani, 2 specimens."  
P. 173, line 29. After "pointed" add "upper crest."

1. *Nycticebus cinereus*.

*Nycticebus cinereus*. M.-Edw., Nouv. Archiv. du Mus., Bull. III, p. 11,  
pl. III (1867); Anderson (partim), Anat. and Zool. Res., p. 103  
(1878); Lyon, Proc. U. S. Nat. Mus., XXXI, p. 533 (1906);  
Gyldenstolpe, Arkiv. för Zoologi, Stockholm, 8, No. 23, p. 8 (1914).  
*Nycticebus tardigradus*, Blanford (partim), Faun. Brit. Ind., Mamm.,  
p. 44 (1888); Flower, P. Z. S., 1900, p. 321.

1 adult, sex unknown. Koh Lak, S. W. Siam. [No. 2084].

This example of the Slow Lemur or Lorís, of which I give a description below, closely resembles the Siamese animal described by







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ON SOME SIAMESE MAMMALS.

BY C. BODEN KLOSS, F.Z.S.

The following notes deal with some of the material sent me for examination since my paper in the last number of this Journal was written; several undescribed or rare species from Messrs Williamson and Smith remain to be dealt with later.

The principal value of the present notes lies in the addition which they make to our knowledge of the range of certain forms, several of the animals obtained by Mr. Aagaard at Bangnara being of particular interest in this respect.

Patani is the southernmost state belonging to Siam on the east coast of the Malay Peninsula; most of the other localities are in Siam proper, and are either well-known places or have been described in my earlier report.

1. *Nycticebus cinereus*.

*Nycticebus cinereus*, M.-Edw., Nouv. Archiv. du Mus., Bull. III, p. 11, pl. III (1867); Anderson (partim), Anat. and Zool. Res., p. 103 (1878); Lyon, Proc. U. S. Nat. Mus., XXXI, p. 533 (1906); Gyldenstolpe, Arkiv. för Zoologi, Stockholm, 8, No. 23, p. 8 (1914). *Nycticebus turdigradus*, Blanford (partim), Faun. Brit. Ind., Mamm., p. 44 (1888); Flower, P. Z. S., 1900, p. 321.

1 adult, sex unknown. Koh Lak, S. W. Siam. [No. 2084].

This example of the Slow Lemur or Loris, of which I give a description below, closely resembles the Siamese animal described by



Flower, and both appear to be examples of *N. cinereus* stated by Milne-Edwards to extend from Siam to Cochin-China. The earliest form described, *N. coucang* (Boddaert), is said to have come from "Bengal", (though from the name one would deduce a more south-eastern provenance, as "konkang" is the Malay name for the slow lemur), but so little is known of it that the subspecific distinctness from it of *cinereus*, now generally maintained, may eventually be disproved.

Wroughton (Journ. Bombay Nat. Hist. Soc., XXIII, p. 702) has recently recorded a slow lemur from Mergui under Boddaert's name and, though the locality is quite close to Koh Lak, there is apparently a considerable difference in appearance between it and the more eastern specimens. This lies principally in the warmer colour of the Tenasserim individual, in which also the dorsal stripe extends from the base of the tail to the crown where it splits and branches to the ears and eyes. So far as I am aware, this last is a character of *N. c. malayanus*, Anderson, of the Malay Peninsula, rather than of *N. c. coucang*, in which the face markings are said to be indistinct. It is very desirable that further specimens from Indo-China should be studied in order to clear up the present uncertainty.

The appearance and characters of the Koh Lak example are as follows:—head, nape and back between shoulders, fore-limbs from below shoulders, greater part of hind-limbs, underside of body, greyish-white; the hind limbs very slightly tinged with brownish. From the crown to commencement of the rump extends a cinnamon-brown stripe, broadest behind the shoulders where many hairs are black-tipped, narrowest anteriorly where it is clearly defined and rather lighter in colour, while posteriorly it is indistinct and gradually fades into the colour of the rest of the body which is a sort of dull ochraceous-tawny, for the most part strongly frosted with white. The eyes are surrounded by rings of mummy-brown, and the ears are tawny-ochraceous situated in elongate patches of the same colour, but neither the eye nor ear patches are in any way connected with each other or with the dorsal stripe. The hairs of the pelage have grey bases throughout.

On the skull the temporal ridges are separated by a space of about 4 mm. Dimensions:—greatest length, 60; basal length, 50; zygomatic breadth, 41.7; width of braincase above zygomata,



30.5; maxillary tooth-row exclusive of incisors, 21.5; mandibular length, 39.3.

## 2. *Felis temmincki*.

*Felis temmincki*, Vig. and Horsf., Zool. Journ., III, p. 451 (1828);  
Blanford, Faun. Brit. Ind., Mamm., p. 75 (1888).

1 ♂. Neighbourhood of Chiengmai, North Siam. Obtained by Mr. H. C. St. J. Yates, Jan. 1916 [No. 2012].

The Golden Cat is represented by a flat skin, lacking skull, limbs or tail, but the latter is said to have had the terminal portion white beneath; it appears to be a very typical example. This is a handsome animal with its ferruginous unspotted coat, black-tipped ears and pale face-markings; it attains a total length of about four feet of which the tail is some 18 inches.

De Pourcargues (Mission Pavie, Indo-Chine, Etudes Diverses III., p. 546) states that this cat inhabits Siam and Laos, but I have been unable to find any exact record for these localities<sup>1</sup>

## 3. *Ailurin planiceps*.

*Felis planiceps*, Vig. and Horsf., Zool. Journ., III, p. 450, pl. XII (1828); Cantor, Journ. Asiat. Soc. Bengal, XV, p. 245 (1846)

A flat skin with skull from Bangnara, Patani, Peninsular Siam. Collected by Mr. C. J. Aagaard. [No. 2115].

The discovery of the Flat-headed Cat in Patani considerably extends the known range of the species in the Peninsula, as apparently it has only been recorded previously from as far north as Selangor (Flower, P. Z. S., 1900, p. 326).

The specimen is rich dark brown above, the hairs annulated with whitish which causes a frosted appearance except on the median dorsal line where the annulations are fewer and tawny. The head is markedly tawny and the shoulders are suffused with the same colour. Throat, chest and under side of body are whitish and there are obsolete dark bars on the limbs, and spots on the sides and belly. The forehead and cheeks are striped with white.

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1. Since the above was written, this cat has been recorded from Bangkok (Journ. Bombay Nat. Hist. Soc., XXIV, 1916, p. 618). I take the opportunity to correct this statement, as the example was in reality obtained near Raheng, Central Siam, by Mr. G. F. W. Elwes.



The head and body are about 18 inches long, the tail 6 inches only.

Skull of the present example:—greatest length, 100; basal length, 87; palatal length, 38; rostral breadth, 23; least interorbital breadth, 12.5; greatest cranial breadth, 39; zygomatic breadth, 58;  $pm^1 - m^1$  (alveolar), 23.2;  $pm_1 - m_1$  (alveolar) 23.4; least alveolar breadth of palate between  $m^1 - m^1$ , 22 mm.

The genus *Ailurin* is distinguished from *Felis* by the large size of the anterior premolars and by the two distinct roots to each of the upper pair of these teeth. The cheek teeth are unusually long and are remarkable on account of the height of their cusps. The canines are also markedly long.

Amongst other local cats the skull is most nearly resembled in form by those of *Felis temmincki* and *F. leynalensis*, but it is more elongate than either, with a more pronounced muzzle, while the orbits are surrounded by complete bony rings, the posterior portions of which are broad.

#### 4. *Pteropus vampyrus malaccensis*.

*Pteropus vampyrus malaccensis*, Andersen, Ann. and Mag. Nat. Hist. (8) II, p. 368 (1908); id. in Kloss, P.Z.S., 1916, p. 39.

*Pteropus vampyrus*, Bonhote, Fasciculi Malayenses, Zool., Pt. I, p. 14 (1903).

1 ♂ imm. Bangnara, Patani, Peninsular Siam. Collected by Mr. C. J. Aagaard [No. 2116].

This is the largest of all the fruit-bats or "flying foxes" and has not been recorded with certainty farther north in the Peninsula, though it occurs again in S. E. Siam. Elsewhere in Siam and in Tenasserim its place is taken by a smaller species known as *P. intermedius*, Andersen.

#### 5. *Hipposideros bicolor*.

*Hipposideros bicolor*, Temm., Mon. Mamm., II, p. 18 (1835-41); Blanford, Faun. Brit. Ind., Mamm., p. 289 (1891).

1 ♂ adult in alcohol. Bangnara, Patani, Peninsular Siam. Collected by Mr. C. J. Aagaard [No. 2088].

This example of the bicoloured leaf-nosed Bat is rather small, the forearm measuring 34 millimetres.



6. *Petaurista annamensis barroni*.

*Petaurista annamensis barroni*, Kloss, *antea*, p. 23.

1 ♀ ad., Pu Khao Sammitin, Pitsanulok, Central Siam, 2000 ft. ; 12th Feb., 1916. Obtained by Mr. W. J. F. Williamson's collector [No. 2020].

Whereas the type of this race of Flying-squirrel was in rather faded and abraded pelage, the fur of this example is quite fresh and unworn, and therefore presents the following slight differences from the Sriracha example. Brown of the upper parts rather deeper, grizzling more copious, white shoulder-patches very marked, edges of parachute pale grey, under side of body rather more white: the colour of the interfemoral membrane extends slightly on to the tail which is then grey for a short distance instead of drabby; as in the type, the drab colour extends along the under surface almost to the tip.

Unfortunately no dimensions have been recorded and the base of the skull has been cut away. Greatest nasal length, 24.5; greatest breadth of combined nasals, 13.8;  $p^4-m^3$  (alveolar), 17.2; breadth between tips of post-orbital processes, 32.2. For other measurements see table p. 87.

7. *Ratufa phaeopepla*.

*Ratufa phaeopepla*, Miller, Smithsonian Miscellaneous Collections, Vol. 61, p. 25 (1913).

*Ratufa melanopepla*, Wroughton, Journ. Bombay Nat. Hist. Soc. XXIII, p. 712 (1915).

1 ♂ ad. Muang Pra, North Siam, 16th April 1916. Obtained by Messrs Williamson and Smith's collectors. [No. 2093].

This form of Giant-squirrel was described from specimens taken in the extreme south of Tenasserim (Sungei Balik), and has since been received from Moulmein<sup>1</sup>; the present example therefore considerably extends its range. It differs from *R. melanopepla* and the various forms of the latter, in not being black on the back. Colour of upper parts deep chestnut-brown, limbs and tail darker; top of head, ears, hands and feet, black; an irregular Sudan-brown patch on the occiput. Under surface of body and limbs about antimony yellow,

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<sup>1</sup> Thomas and Wroughton, Journ. Bombay Nat. Hist. Soc., XXIV, p. 228 (1916).



paler on the throat and flanks. Sides of face and neck and inner sides of fore-limbs thence extending slightly over their upper surfaces, cream colour.

(For measurements, see table p. 87)

### 8. *Ratufa aureiventer*.

*Ratufa affinis aureiventer*, Bonhote, Ann. and Mag. Nat. Hist. (7), V, p.495 (1900).

*Ratufa aureiventer*, Kloss, Journ. Fed. Malay States Mus., IV, p.147 (1911).

1 ♀ ad. Bangnara, Patani, Peninsular Siam. Collected by Mr. C. J. Aagaard [No. 2117].

Though this specimen is in very worn pelage I have no hesitation in recording it as an example of *R. aureiventer*. I can find no trace of the annulations on the back which are one of the principal characters of *R. pyrrsonota* and it has the café-au-lait tail which is so frequent in the former, whereas in the latter the tail is chocolate coloured.

The presence of an *aureiventer* squirrel in Patani is most unexpected and considerably extends the range of that form hitherto found only to the south of North Perak and North Pahang, beyond which *R. pyrrsonota* was the only yellow giant-squirrel met with previously.<sup>1</sup> It differs from the latter in having the upper parts not, or only faintly, annulated, and in having the tail often practically concolourous with the the back.

### 9. *Sciurus prevosti prevosti*.

*Sciurus prevostii*, Desmarest, Mamm., p. 335 (1822).

1 ♂ ad. Bangnara, Patani, Peninsular Siam [No. 2118]. Collected by Mr. C. J. Aagaard.

Top of head, back and entire tail, shining black, but the distal half of the latter sometimes bleached to brownish; chin and sides of face, and sometimes sides of neck, greyish white; a broad white stripe along the sides from neck or shoulders continued over the thigh to the ankle. Under surface of body and limbs, hind feet, hands and forearms burnt sienna, the red of the abdomen frequently separated from the white of flanks by an indistinct black stripe.

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<sup>1</sup> Antea, p. 15.



In many animals there is an extension of the white, which in its fullest degree covers the upper sides of the forearms to the wrists, and partly covers the hands and also the hind feet, while sometimes the latter and the elbows are partially blackened: but as the different colour patterns are not confined to separate areas they are not subspecific.

The Patani specimen illustrates the increase of white to a full degree. Mr. Aagaard assures me that it was a truly wild squirrel shot near Bangnara, and therefore it forms a very interesting extension of the range of this race which we have hitherto known only from Johore, Negri Sembilan and South Pahang and have regarded as confined to the southern extremity of the Malay Peninsula.

I have already noted the apparent fact that some southern races of animals are slower to change on the east side of the Peninsula than on the west<sup>1</sup> but this is the most pronounced instance I have met with.

#### 10. *Sciurus finlaysoni*.

*Sciurus finlaysoni*, Horsf., Zool. Res. Java, 1824; Kloss, *antea*, p. 16.

1 ♀ ad., Pak Jong, E. Siam, 31 May 1916. Obtained by Mr. W. J. F. Williamson's collector. [No. 2017].

A very typical example of the white Siamese squirrel.

(For measurements see table p. 87.)

#### 11. *Sciurus caniceps*.

*Sciurus caniceps*, Gray, Ann. and Mag. Nat. Hist., X, p. 236 (1842); Kloss, *antea* p. 17

*Sciurus chrysnotus*, Blyth, Journ. Asiat. Soc. Bengal, XVI, p. 873, pl. XXXVII, fig 1 (1847).

*Sciurus epomophorus fluminalis*, Robinson and Wroughton, Journ. Fed. Malay States Mus., IV, p. 233 (1911).

1 ♀ ad., Me Song forest, Muang Pre, N. Siam, 20 April 1916. Obtained by Messrs. Williamson and Smith's collectors. [No. 2095].

1 ♀ ad., Pak Jong, E. Siam, 2 June 1916. Obtained by Mr. W. J. F. Williamson's collector. [No. 2106].

Both the squirrels still retain in part the golden dorsal coat of the winter pelage. In the Me Song example it extends from the neck on to the base of the tail, but the golden hairs are much abraded

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<sup>1</sup> Journ. Fed. Malay States Mus., IV, p. 137; V, p. 113.



and on the anterior half of the body are largely replaced by patches of the new grizzled grey summer pelage.

In the Pak Jong animal, taken later in the year, the clear yellow area is confined to the rump and the base of the tail, but the grizzled pelage which clothes the back and sides between the rump and the occiput is suffused with yellow which is brightest behind the ears.

( For measurements see table p. 87 ).

## 12. *Tamiops barbei kongensis*.

*Sciurus maclellandi kongensis*, Bonhote, P. Z. S., 1901, p. 54.

1 ♀ ad., Muang Pre, North Siam, 28 April 1916. Obtained by Messrs. Williamson and Smith's collectors [No. 2097.]

This race of pygmy striped squirrel differs from *Tamiops barbei barbei* (Blyth) of Tenasserim in being considerably paler in colour, and links that form with *Tamiops rodolphi* (M.-Edw.) of French Indo-China, etc., which, though agreeing in the colour of the undersurface, is elsewhere paler still.

*T. b. kongensis* was described from a Raheng specimen and with it were identified examples from Nan.

The present individual has the upper ground-colour pale grey, variably suffused with buff. There are four pale stripes on the back, the outer pair (broader than the others) running from the nose to the rump, they are pale yellow-orange on the body and cream on the neck and head; the inner pair, starting from the shoulders, are ochreous-buff. The median dark dorsal stripe is clear black, the outer pair are black grizzled with ochraceous-buff. The ears are edged with black posteriorly, and there are small black patches behind them; the outer surfaces are black, and at the tips are tufts of white hair having black bases. The tail is annulated black and ochraceous-buff, the hairs with whitish tips except at the extremity. The under-surface of the body is pale orange-yellow.

( For measurements see table p. 87 ).

## 13. *Menetes berdmorei mouhoti*.

*Sciurus mouhoti*, Gray, P. Z. S., 1861, p. 13.

*Menetes berdmorei mouhoti*, Kloss, P. Z. S., 1916, p. 48.

1 ♀ ad. Khao Seabab, S. E. Siam, 2,000 ft. March, 1916. [No. 2112].



Though an unusually pale example, this squirrel is yet evidently a member of the above race. The upper parts have a faded, washed-out appearance but can be almost matched by the dullest of a series obtained by me in S. E. Siam in January 1915. The brown on the middle back is very dull and pale, and the black stripes there are obsolete, while in the areas between the buff stripes and the sides, brown predominates over the black. The under surface of body and limbs is white suffused with buffy, the latter deepest on the hind limbs.

(For measurements see table p. 87).

#### 14. *Menetes berdmorei consularis*.

*Menetes berdmorei consularis*, Thomas, Journ. Bombay Nat. Hist. Soc., XXIII, p. 24 (1914).

1♂ subad., 1♂, Muang Pre, North Siam, 12th and 13th May 1916. Obtained by Messrs. Williamson and Smith's collectors. [No. 2102, 2103].

The type of this race was collected at Nan in October. The present examples, which are practically topotypes, exhibit a slight difference, which is probably seasonal, for the under surface of body and limbs is pure white instead of yellowish white. There are no dark stripes on the back; those on the sides, below the outer buff stripes, are pure black in one example, but slightly grizzled with rufous in the other. The upper buffy side stripe is most distinct, the lower blends with a short indistinct grey-black stripe which separates it from the white of the under surface. The back, which is the brightest portion of the pelage, is amber-brown speckled with black.

(For measurements see table p. 87).

#### 15. *Epimys surifer finis*.

*Epimys surifer finis*, Kloss, P. Z. S., 1916, p. 51; id., Journ. Nat. Hist. Soc. Siam, II, p. 26, 1916.

1 ♀ adult. Khao Seab, 2000 feet, Chantabun, S. E. Siam, March 1916. [No. 2111].

#### 16. *Epimys rattus*, subsp.

*Epimys rattus* subsp., Kloss, antea p. 26.

1 ♀ subad., Pak Jong, E. Siam, 3 June 1916. Obtained by Mr. W. J. F. Williamson's collector [No. 2019].



17. *Acanthion brachyurus*.

*Hystrix brachyura*, Linn., Syst. Nat. I, Ed. 10, p. 57 (1758).

*Hystrix grotei*, Bonhote, Fasciculi Malayenses, Zool., Pt. 1, p. 39, pl. III (1903).

*Acanthion brachyurus*, Thomas, Ann. and Mag. Nat. Hist. (8), XVII, p. 137 (1916).

The short-tailed Porcupine, the largest local species of the family, is represented by an immature skull from Bangnara, Patani, collected by Mr. C. J. Aagaard [No. 2121]. Greatest length, 126; greatest breadth, 66; greatest length of nasals, 52; greatest breadth of nasals, 25; length of frontal suture, 32 mm.

18. *Tragulus kanchil affinis*.

*Tragulus affinis*, Gray, P. Z. S., 1861, p. 138; Kloss, op. cit., 1916, p. 63.

1 ♂ juv. Chantabun, S. E. Siam, March 1916 [No. 2110].  
Hind foot 114 mm.

1 ♂ juv. Muak Lek, (near Saraburi) E. Siam, May 1916  
[No. 2104]. Mr. W. J. F. Williamson's collector.

Hind foot, 113 mm.



Measurements of Siamese Squirrels in Millimetres.

	Sex	Head and Body	Tail	Hind foot	SKULL.							No.	Remarks
					Greatest length	Condylar length	Palatilar length	Diastema	Upper Molar row	Median nasal length	Inter-orbital breadth	Zygo-matic breadth	
<i>Petaurista annamensis baroni</i>	♂	...	550*	81*	...	...	35.0	16.0	...	18.0	47.0	47.0	2020 teeth moderately worn
<i>Ratufa phaeopepla</i>	♂	398	509	82	73.7	61.0	27.0	15.0	14.7	23.0	29.2	43.0	2093 "
<i>Sciurus fildaysoni</i>	♂	...	...	...	55.7	47.1	23.0	13.0	10.2	17.5	21.2	33.7	2107 "
<i>Sciurus caniceps</i>	♀	218	261	55	58.4	50.0	25.0	14.0	11.3	18.0	19.2	33.0	2095 teeth scarcely worn
Pak Jong, E. Siam	♀	...	...	...	58.2	49.3	24.3	13.2	11.0	16.3	20.0	33.2	2106 "
<i>Tamias barbei hongensis</i>	♀	129	117	30	32.0	26.6	12.4	6.9	5.6	8.2	12.2	19.6	2097 teeth moderately worn
Muang Pre, N. Siam	♂	190	140	45	51.2	43.9	24.0	13.7	10.3	16.2	14.0	28.0	2112 teeth slightly worn
<i>Menetes herdmorei mouhoti</i>	♂	195	137	41	48.1	41.6	22.3	12.1	10.1	13.2	12.0	25.6	2102 teeth scarcely worn
Khao Seap, S. E. Siam, 2000 ft.	♂	194	139	43	49.5	43.3	23.1	13.0	9.3	15.0	12.0	27.0	2103 teeth exceedingly worn
<i>Menetes herdmorei consularis</i>	♂	...	...	...	...	...	...	...	...	...	...	...	
Muang Pre, N. Siam	♂	...	...	...	...	...	...	...	...	...	...	...	
"	♂	...	...	...	...	...	...	...	...	...	...	...	

\* Approximate measurements from dried skin.



## ON A NEW MOUSE-DEER FROM UPPER SIAM.

By C. BODEN KLOSS, F.Z.S.

Amongst the specimens of mammals which have been sent me from Siam is an example of a Lesser Mouse-deer which, I believe, becomes the most northerly specimen on record. Though it does not notably differ in colour from *T. k. affinis*, Gray, of Cambodia, etc., yet it is so much larger (head and body, 525; hind foot, 125; skull, 103 mm. against 438; 110; 89.5 for *T. k. affinis*<sup>1</sup>) that I consider it to be a distinct local form allied to that race and have named it in honour of Mr. W. J. F. Williamson.

In size the animal most closely agrees with the strikingly-coloured *Tragulus versicolor*, from Nhatrang, S. Annam<sup>2</sup>, but whereas that is regarded as a member of the Greater Malayan Mouse-deer (or *javanicus*) group, the present individual unquestionably belongs to the finer-haired Lesser Mouse-deer (or *kanchil*) section.

***Tragulus kanchil williamsoni*, subsp. nov.**

*Type* (and only specimen examined). Adult female (skin and skull) with worn teeth. Author's No. 2994/CBK. Obtained at Me Song forest, Pre, North Siam, on 16th April 1916 by the collectors of Messrs Williamson and Smith.

*Colour*. Above finely speckled ochraceous-buff tending to tawny on the lumbar region and rump; blacker on the head, lighter on the sides, on the nape a faintly indicated stripe of the same colour as the occiput; the hairs of the posterior rump with long, dark brown tips. Fore-limbs ochraceous-buff becoming ochraceous-orange on their outer sides; hind-limbs ochraceous-buff darkening to deep ochraceous-tawny above the hocks; upper side of tail ochraceous-tawny: ears covered externally with fine, short, dark brown hair: upper eyelid partly blackish.

Underside of head, body and tail white, this colour extending along the fore-limbs as far as the hocks only but on the hind-limbs narrowly down the front of the cannon bones.

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<sup>1</sup> Also a female with worn teeth, vide Kloss, P.Z.S., 1916, p. 63.

<sup>2</sup> Thomas, Ann. and Mag. Nat. Hist., (8), v, p. 545 (1910).



There is the usual throat-triangle which is of the same colour as the sides of the neck, but it is not closed anteriorly and the sides are only 6-8 mm. wide. A faintly-indicated ochraceous line is present down the centre of the chest and expands somewhat on the abdomen.

*Measurements.* External measurements taken in the flesh:—head and body, 525; tail, 74; hind foot, 125; ear, 43. Skull:—greatest length, 103; condylo-basal length, 94.7; basal length, 88.3; palatal length, 63; length of upper tooth-row:—alveolar 33.2, crowns 34.5; crowns of premolars only, 17; greatest length of nasals, 30; greatest breadth of combined nasals, 13.3; least interorbital breadth, 27; zygomatic breadth, 45.3 mm.



PRELIMINARY REPORT ON THE FAUNA OF THE TALÉ SAP  
OR INLAND SEA OF SINGGORA.

BY N. ANNANDALE, D. SC., F. A. S. B.

( *Director, Zoological Survey of India* ).

WITH A MAP.

My first visit to the Talé Sap was made in 1899 as a member of the Skeat Expedition to Peninsular Siam. I was there again in 1902, but merely as a traveller, for my object was to reach Penang from Singgora as quickly as possible. The following notes are based mainly on a third visit in January and February, 1916. The object of this last visit was to obtain materials for comparison with a somewhat similar lake or lagoon on the east coast of India, the Chilka Lake in Orissa and the Madras Presidency, on which Mr. S. W. Kemp and I have been engaged for some years in preparing a faunistic report.<sup>1</sup> Both lakes are directly connected with large, open, tropical bays, the Chilka Lake with the Bay of Bengal, the Talé Sap with the Gulf of Siam; both are shallow and muddy, and both contain water that is, at least in part, brackish, and that varies in salinity in accordance with seasonal and climatic conditions. Both, moreover, are separated, geographically and faunistically, into an outer and an inner region in which conditions of life are different, but not always different in precisely the same way, throughout the year.

My knowledge of the varying conditions due to hydrographic and other changes in the Chilka Lake is naturally much fuller than that I possess of the Talé Sap. At the former not only had I the invaluable collaboration of Mr. Kemp in the field, but we were able to make observations at different seasons and at frequent intervals; whereas in the Talé Sap, I worked alone so far as scientific help was concerned, and only at one period, and that period was at the extreme end of the wet and the beginning of the dry season, in some respects perhaps the most unfavourable from the point of view of the collector.

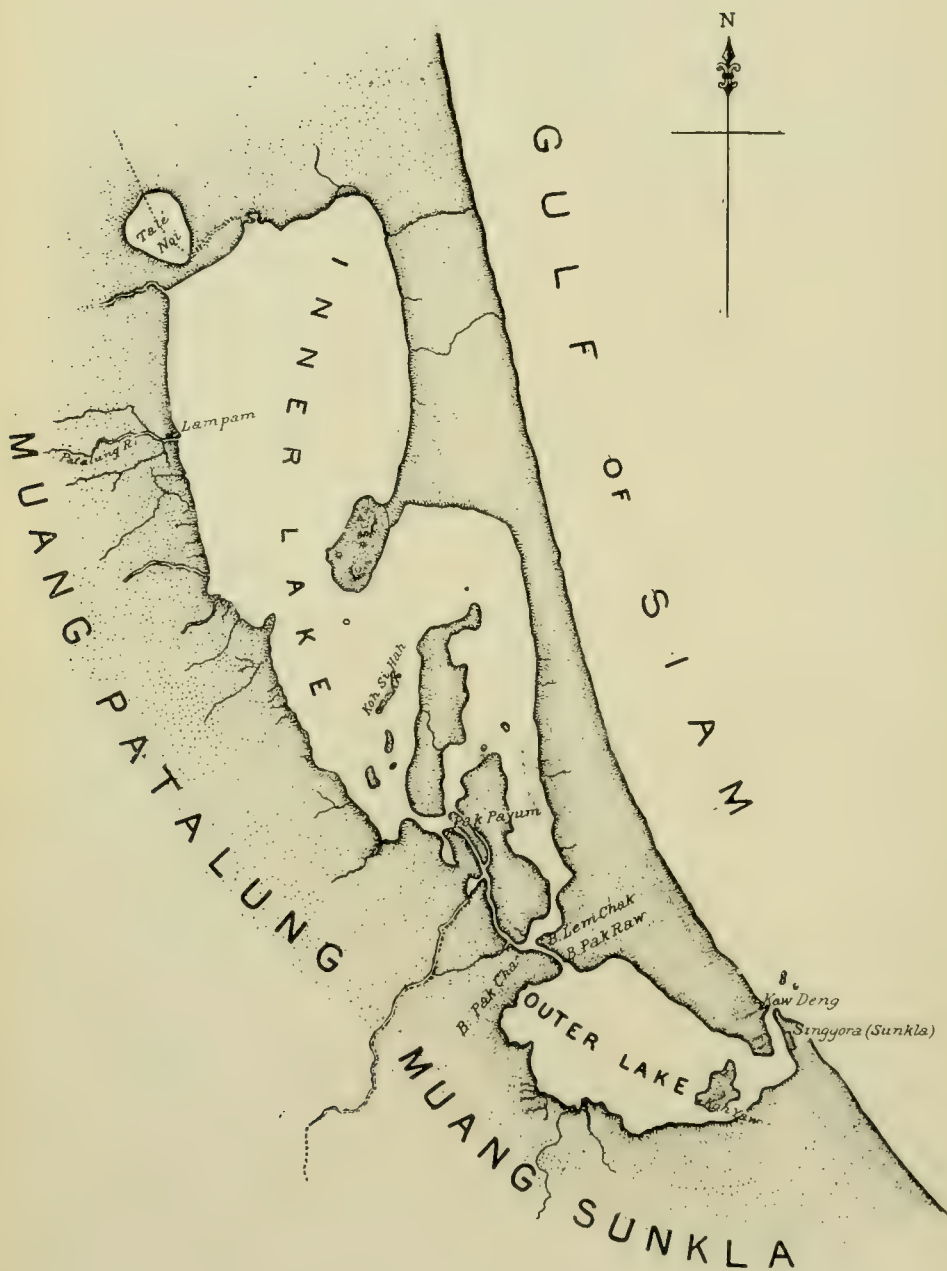
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<sup>1</sup> "Fauna of the Chilka Lake." *Mem. Ind. Mus.*, vol. V. 1915—(still in progress).









SKETCH MAP OF THE TALÉ SAP.



In spite of this, interesting results were obtained that may already be discussed in a general way. Before discussing them it will be necessary to give a few additional facts about the "Great Lake" (Talé Sap) or Inland Sea. Like the Chilka Lake it is a great lagoon, nowhere much more than 16 feet deep, and separated from the sea merely by a narrow stretch of sandy country. It is between 50 and 60 miles long, and opens at its southern end into the Gulf of Siam by a short channel, on the southern bank of which the town of Singgora, or Songkla, is situated. A peninsula and a group of large islands separate the lagoon into an outer (southern) and an inner (northern) lake, connected together merely by narrow waterways of considerable length. In the inner lake conditions are almost lacustrine, and the water, except for a slight infusion at times from the connecting channels, is practically fresh; but in the outer lake the water, varying in salinity from season to season, and, probably at times from hour to hour, is always brackish. At the time of my visit its specific gravity (reduced to a standard temperature of 15° C.) was found to range at different spots, from 1.0035 to 1.0085, whereas that of the inner lake was only 1.002 at the point at which the main connecting channel opened into it. Hardly any trace of salinity was indicated by specific gravity further north.

The faunas of the two regions differ, as might be expected, considerably and may be discussed separately.

### I. Fauna of the Inner Lake.

*Vertebrates.* Only two species of snake were observed in the inner lake. They were *Herpeton tentaculatum*, which has not hitherto been recorded from Peninsular Siam, and *Hypsirhina plumbea*, a widely distributed Indo-Malayan form. In the lower reaches of the Patalung River at least two tortoises are common, namely *Damonia subtrijuga* and *Bellia crassicolis*, and both of these probably enter the lake occasionally.

At the margin I found three species of frog, one of *Oxyglossus* and two of *Rana*. The two latter have hitherto been included in the composite group to which the name *R. tigrina* has been applied, but should in my opinion be known as *R. rugulosa* Wiegmann, and *R. cancrivora* Gravenhagen.



Very few fish are found in this part of the lake, but I made a large collection at Lampam from the lowest reaches of the Patalung River and from the creeks in its small delta. Most of the genera represented are well known and widely distributed fresh-water genera such as *Anabas*, *Osphromenus*, *Mastacembelus*, *Panchax*, *Barbus*, *Rasbora*, *Monopterus*, etc., and a large proportion of the species have already been recorded from the Malay Peninsula; but a few estuarine forms such as *Scatophagus argus* occur, and a certain proportion are new to science. Of these the most interesting is a new species of *Etroplus*, the only Oriental genus of the family Cichlidae. This family has not hitherto been found east of the Bay of Bengal, but has a wide range in tropical America and tropical Africa and has made its way northwards, through channels now completely blocked up, into the Jordan system. Several species of *Etroplus* are found in Peninsular India and Ceylon, but none have as yet been recorded from Burma or Siam or any part of the Malay region. A species of Sting Ray, probably *Hypholophus sephen*, occurs on the bottom of the inner lake. *H. sephen* makes its way far up the Ganges and other rivers<sup>1</sup>.

*Molluscs.* With a few noteworthy exceptions, the molluscs found in the inner lake are lacustrine forms. Those that live among weeds near the edge belong to the genera *Vivipara*, *Melania* and *Amnillaria*, while inside the mouth of the Patalung River, *Limnaea*, *Ancylus* and *Planorbis* are also represented. These genera are abundant in all eastern lakes or rivers, and the species found near Lampam are divided pretty equally between Malayan and Indo-Chinese forms; but another form dredged both at Lampam in the river-mouth and out in the lake seems to be unique among its family in living in fresh water. It is a species of *Marginella* and, curiously enough, an allied but distinct species replaces it in the outer lake.

The bivalves taken on the bottom, both in the lake and in the river-mouth, belong to the genera *Corbicula* of the Family Cyrenidae, and *Dimotus* of the family Unionidae. At least three species of the former occur; all can be identified with forms already known from the Malay Peninsula or Indo-Chinese countries. The single Unionid

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<sup>1</sup>. See Chaudhuri, *Journ. Asiat. Soc. Bengal* (n. s.), Vol. VI, p. 427 (1910).



(*D. contradens*) is interesting in that it is also found in Perak and Sumatra, but is represented in Cambodia and other countries to the east of the Gulf of Siam by distinct local races.

The two most interesting genera of bivalves of this region, however, were found only in the open lake. They are *Modiola* of the family Mytilidae or true mussels and *Scaphula* of the family Arcidae. The former genus is essentially a marine one, and has been dredged at considerable depths in the Bay of Bengal. In the rivers and lagoons of India and Burma certain species make their way well into brackish water and can even exist for periods in pure fresh water, while further east, in Siam, Cambodia and Java, allied forms have become wholly fluviatile. Finally, *M. lacustris* was discovered in a lake in the centre of China. The species found in the Ta'é Sap was described some years ago by E. A. Smith<sup>1</sup>, from specimens collected by Dr. R. Evans and myself at the Koh Sih-Ha, as *M. evansi*. It is very abundant on rocks, dead tree-trunks and weeds in the neighbourhood of these islands, but I found no specimens in the outer lake that I could assign to it with certainty.

*Scaphula* is a genus hitherto only known from Indian and Burmese river-systems that open into the Bay of Bengal. It is a dwarfed and slightly modified derivative of the marine genus *Arca*, some species of which (notably *A. granosa*) habitually make their way into brackish water. The Talé Sap species is distinct from any of the Indian or Burmese forms. It is common on weeds all over the inner lake and occurs, much more sparingly, on stones in the outer lake round Koh Yaw near Singgora.

*Insects.* I had no time to collect insects seriously in any part of the Talé Sap, but two species of surface-bug (Hydrometridae) were observed at different places in the inner lake. Close to the edge near Lampam the widely distributed *Gerris spinolae* was abundant, while off Pak Payun, at the mouth of the main channel connecting the two parts of the lake-system, *Halobates sexualis* was by no means uncommon. The latter was described by Distant<sup>2</sup>, from an estuary opening into

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1. Smith, *Journ. Conch.* vol. X, p. 368, fig. (1903).

2. Distant, "Rhynchota Heteroptera" in Annandale and Robinson's *Fasciculi Malayenses*, Zoology, vol. I, p. 258, pl. xv, figs. 10, 10a, 10b, (1933).



Patani Bay on the same coast. The head of a water snake (*Herpeton*) taken near the mouth of the Patalung River was covered with the eggs of a bug of the same family.

*Crustacea.* There are comparatively few Crustacea in the lake. The only crab observed was a species of *Potamonidae*—an almost exclusively fluviatile and lacustrine family. It appears to belong to a form (*Potamon germaini*) common in Siam and the northern part of the Malay Peninsula, and is found in considerable numbers both at the edge of the lake and in streams, rice-fields, etc., in the vicinity. Small shrimps belonging to several species of the family *Atyidae*—also a freshwater family—abound among weeds in several places. One of them has already been described by Lanchester<sup>1</sup> as *Caridina gracillima*; the type specimens were taken by Dr. Evans and myself at the mouth of the Patalung River in 1899. Inside this river several species of *Palaemon* are caught as food, ranging in size from the gigantic *P. carcinus*, the largest of all the freshwater prawns, which occurs all over tropical and subtropical Asia east of Arabia, to the little *P. lanchesteri* de Man (= *P. paucidens* Lanchester), which is only known from Singgora and Patalung. *Palaemon* is again a freshwater genus, though, as we shall see, certain species migrate into brackish water or can even live in the sea.

In the central part of the inner lake no true crabs or shrimps were found, but a "Schizopod" of the family *Mysidae* was taken in small numbers. Though this family is mainly marine, certain species have established themselves, both in Europe and in Asia, in brackish and even in fresh water. The Talé Sap form occurs very sparingly if at all in the outer lake and would, therefore, seem to have become strictly lacustrine in habits. Neither Amphipods nor Isopods are abundant in this region, either near the edge or in the central parts. A single specimen of the curious genus *Quadrivisio*, found in brackish water in India and East Africa and common in the outer lake, was obtained at the mouth of the Patalung River, while a narrow-bodied Isopod was found fairly common in the bed of the lake.

The Plankton of this region is probably scanty at all sea-

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1. Lanchester, *Proc. Zool. Soc. London*, 1901, p. 560, pl. xxxiv, fig. 1.



sons. In January only a few Copepods and Daphniids were taken in my townets.

*Polyzoa.* The Polyzoa observed in the inner lake were all true freshwater forms, belonging to the cosmopolitan genera *Paludicella* (of which an interesting new species was taken at Lampam), *Fredericella* and *Plumatella*. Several species of the last are represented in my collection, including *P. tanganyikae* Rousselet, which, as its name indicates, was described from Central Africa and is not uncommon in Peninsular India.

*Sponges.* The only sponges (three species) found in the Talé Sap belong to the cosmopolitan freshwater genus *Spongilla*, and one of them cannot be separated specifically from the common European *S. lacustris*. Dry specimens of this species were found in a field near Pak Payun, where they had been left by a retreating flood. Specimens of two species were found at Lampam. One of these (*S. nana*) I recently described from the Chilka Lake in Orissa, while the other is a particularly interesting new species of the subgenus *Eunapius*. So far as I am aware, these are the only freshwater sponges (with the exception of *Ephydatia blebbyia* Evans,<sup>1</sup> from the Province of Patani) as yet found either in the Malay Peninsula or in Siam; so far as it is yet known, the aquatic fauna of these countries offers a striking contrast to that of India and Burma in the poverty of its Spongillidae.

Even this summary description of the fauna of the inner lake of the Talé Sap system is sufficient to show that it is in the main a true lake-fauna, exhibiting its connection with the sea merely in the presence of a few estuarine fishes and possibly one or two molluscs of marine origin. The most noteworthy of these is the *Marginella*, but the fact that this species is replaced in the outer lake by another, may indicate that it has become a permanent inhabitant of fresh water, and possibly occurs in other lakes or rivers of Siam or the Malay Peninsula.

The inner lake of the Talé Sap is comparable, therefore, from a biological point of view, not with marine lakes such as the Chilka

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1. Evans, *Quart. Journ. Micros. Sci.* (n. s.) vol, XLIV, pp. 71-109, pls. iiv (1901).



Lake on the east coast of India, but rather with shallow inland fresh-water Lakes such as the Tai Hu in the Kiangsu Province of China and possibly the Tonlé Sap in Cambodia. Comparison with the former is particularly apposite, because there is evidence both geographical and faunistic, that it was connected with the sea at no very distant date and has been isolated by the rapid growth of the Yangtse delta.

## II. The Fauna of the Outer Lake and of the Connecting Channels.

The change of fauna as one proceeds southwards from Pak Payun is remarkable and immediate. We have to deal no longer with freshwater animals, but with marine and estuarine types, some of which are extremely characteristic of marine lakes.

*Mammals.* The only aquatic mammal that I have seen in the Talé Sap is a small Cetacean that inhabits, or inhabited, the main connecting channel at certain seasons of the year. I saw a small school of this porpoise near the upper end of the channel in March and April, 1899, and again in December, 1901; but though it then appeared to be well known to the villagers (who refused to assist in the capture of specimens for any reward that we were able to offer), I was unable to obtain any information about it in January and February, 1916. The species is probably an interesting one and is almost certainly unknown to science. It is remarkable for its small size, long narrow snout and bright brown colour.

*Other Vertebrates.* Several species of sea snake enter the mouth of the Talé Sap freely and are caught in the fishermen's nets near Singgora. The commonest are *Enhydris hardwickii* and *Enhydrina valakadien*. *Chersydrus granulatus* is also caught in the nets, and *Cerberus rhynchops* is common among stones round the shores of Koh Yaw.

One of the two species of *Rana* found at the edge of the lake in the neighbourhood of Lampam (*R. cancrivora*) is also common in the same position near Singgora and does not hesitate to enter brackish and even salt water.

There is a wealth of fish at Singgora, where large numbers of a great variety of species are caught at different seasons, mainly in



stake-nets and dip-nets. The stake-net season terminated in 1916 about the beginning of February, but in the week before it did so I was able to make a large collection. Most of the species are marine and probably swim in and out of the mouth of the lake, but the estuarine forms noted at Lampam also occur with others of like habits. Among the Rays, I collected examples of *Rhynchobatis* (including *R. thovini*, which is a scarce form in the Bay of Bengal), *Trygion*, *Hypolophus*, *Pteroplatea* and *Aetobatis*. Several of the best of the Indian food fishes, for example the Bekhti (*Lates calcarifer*), and the Hilsa, (*Clupea ilisha*), were abundant.

From a zoological point of view, however, the most interesting forms were certain minute Gobies dredged from the bottom of the lake and, in particular, a peculiar little transparent fish which seems to belong to the family Salangidae. This family, which is believed to consist of degenerate relatives of the Salmonidae, has not been found hitherto west of China. Its members, which are more or less anadromous, are remarkable for the transparency of their tissues, for their elongate form and peculiar flattened narrow triangular heads. All the specimens found in the Talé Sap were unfortunately immature, but I have little doubt that they represent post-larval stages in the life-history of a species of *Salanx* or some allied genus that occurs in the Gulf of Siam.

*Molluscs.* A remarkable feature in the fauna of the outer lake was the large number of dead bivalve shells obtained from the bottom in my nets. A great flood, in which enormous volumes of fresh water had been carried through the outer lake and out of its mouth into the sea by a strong and steady wind, had occurred shortly before my visit, and it is possible that this flood had killed some of the molluscs. We noted in the Chilka Lake that in some species a large proportion of the individuals were killed by the monsoon floods. Some of the beds of dead shells in the Talé Sap are, however, probably of older and less incidental origin. This is indicated by the fact that they include large numbers of acorn-barnacle shells which must have been attached to solid bodies of some kind, and that these shells were lying perfectly

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1. Annandale and Kemp, *Men. Ind. Mus.*, vol. V, p. 337 (1916).



free on the bottom, the objects to which they had been attached having completely perished.

The number of molluscs found living in this part of the lake-system was extremely small. The genera represented in my collection are:—*Marginella* ( by an apparently undescribed species ). *Cassidula*, *Potamides*, *Favus*, *Littorina*, *Conradia*, *Stenothyrus* and *Neritina* among the Gastropods, and *Ostrea*, *Modiola*, *Arca*, *Scaphula*, *Sphenia*, *Xylotrypa*, *Theora* and *Anatina* among the Lamellibranchs. Many of these genera ( for example *Cassidula*, *Potamides*, *Neritina*, *Ostrea* and *Arca* ) are represented by species of very wide Oriental distribution that are found in almost every estuary between that of the Indus and that of the Yangtse-Kiang. It is remarkable that the species of the other Lamellibranch genera are in most cases totally different from those recorded or described by Lyngel from shallow water on the other side of the Gulf of Siam. The only species that I can assign with certainty to one found also in the inner lake is the *Scaphula*. Some very small specimens of *Modiola* may belong to *M. evansi*, but most of them seem rather to be the young of *M. undulata*, a species common in Indian estuaries and lagoons but originally described from the Philippines.

*Crustacea*. Most of the crabs of the outer lake belong to the family Grapsidae ( which supplies a very large proportion of the species that haunt the estuaries of Oriental rivers ) and are either shore-crabs or amphibious in habits. Some of these ( such as *Varuna littorata* ) have a very wide range on Indo-Pacific coasts, but a few seem to be, so far as we know at present, peculiar to the Gulf of Siam. The number of species, however, that are identical with those recorded by Miss Rathbun<sup>2</sup> from shallow water on the other side of the Gulf is not, excepting forms of wide range, so large as might be expected. The running-crabs ( *Oxypodidae* ), so characteristic of sea beaches in the tropics, are represented inside the mouth of the lake by but a few species and other families also are poorly represented. Among the

1. Lyngel, "The Danish Expedition to Siam 1899-1900. IV. Marine Lamellibranchiata." *Det Kgl. Vidensk. Selsk. Skr. Kobenhavn*, 7 Raekke, nat. og mat., Afd. v, 3 ( 1909 ).

2. Rathbun, "The Danish Expedition to Siam, 1899-1900. V. Brachyura". *Det Kgl. Vidensk. Selsk. Skr. Kobenhavn*, 7 Raekke, nat. og math., Afd. V, 4 ( 1910 ).



swimming-crabs (Portunidae) the Indian Edible Crab (*Scylla serrata*), which is also the common edible crab of the Malay Peninsula, and the Blue Swimming Crab (*Neptunus pelagicus*) are common. No Potamonid apparently enters this part of the lake, though *P. germaini* occurs in ditches and ponds at Singgora.

Hermit-crabs (Paguridea) are prevented from making their way for any distance into the lake by the absence of large Gastropod shells in which they might protect their soft bodies. At the mouth, the common Indo-Pacific estuarine form *Clibanarius palavensis* is very abundant, living when adult in marine shells such as those of *Purpura* and *Murex* which it brings in from the sea.

The principal edible prawns at Singgora belong partly to the marine and estuarine family Penaeidae and partly to the freshwater genus *Palaeomon*. *Palaeomon carinus*, which has already been noticed as occurring in the Patalung River, commonly enters brackish water in this region to breed, while other members of the genus live in it habitually. The small Atyid shrimps that live among weeds in the inner lake appear near the edge of the outer lake at places where the surface-drainage is sufficient to lessen the salinity of the water. Some interesting burrowing forms occur in the mud of the connecting channel, in particular *Upogebia heterochelir* Kemp,<sup>1</sup> which was only known hitherto from backwaters and marine lakes on the coasts of India.

Several species of Mantis Shrimp (Stomatopoda) occur in the outer channel near Singgora. They all belong to widely distributed types.

A considerable number of Amphipods and Isopods were collected. The former include the four-eyed *Quadrivisio*, the latter are remarkable for the abundance of certain species parasitic, or quasi-parasitic, on fishes. Two of these have been described from the Talé Sap by Lanchester,<sup>2</sup> who has also described a peculiar little barnacle (*Platylepas ophiophilus*)

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1. Kemp, *Mem. Ind. Mus.*, vol V, p. 257, pl. xiii, figs. 6, 7 (1915). Strictly speaking this species, which belongs to the group Thalassinidea, is not a prawn or shrimp as it belongs to the Reptantia and not to the Caridea, but it has a prawn-like appearance.

2. Lanchester, *Proc. Zool. Soc. London*, 1902, pp. 377, 378, pl. xxxv. figs. 5, 8, 9.



from the skin of a snake. The common tropical acorn-barnacle *Balanus amphitrite* often covers the surface of fishing-stakes off Koh Yaw with its shells, but is liable to be killed by floods of fresh water.

*Polyzoa*. The Polyzoa of the outer lake are not unlike those found in similar situations in the Bay of Bengal. The most interesting species is perhaps an undescribed Entoproctous form, representing a new genus but allied to the Indian brackish water *Toxosomatoides*, and more remotely to the North American freshwater *Urnatella*. The Ectoproctous species belong to the genera *Membranipora*, *Triticella*, *Bowerbankia* and *Victorella*, and (with the exception of the *Triticella*) are identical with Indian forms. The *Triticella*, which was found on the tail of a sea-snake and on the shell of *Limulus*, is interesting in that it is a British species (*T. gedicillata*) not previously found in Eastern waters, in which the genus is very scarce.

"Worms". Lanchester<sup>1</sup> has described a small Echiuroid worm from the inner part of the connecting channels under the name *Thalassema sabinum*. I found a specimen exactly answering to his description in the outer channel opposite Singgora, but it differs greatly from the specimens preserved in the Cambridge Museum as the types of the species, and some confusion must have occurred.

Several Polychaete worms live in the mud of the outer channel, and one makes itself conspicuous by the relatively enormous size and the exposed situation of its egg-masses. These are encased in transparent pear-shaped bodies, which are anchored by a basal tube (which represents the stalk) and float like balloons in mid-water at the edge of the lake, and in ditches connected with it. This worm certainly belongs to the family Eunicidae and probably to the genus or subgenus *Marphysa*. The small white calcareous tubes of a Serpulid may be seen in large numbers on logs of wood and other bodies submerged in the outer lake. Similar worms are common in some of the Indian backwaters, but seem to be entirely absent from the Chilka Lake.

*Sea Anemones, Medusae and Hydroids*. At least three kinds of sea-anemone are found in the outer channel of the lake, but they are all small and inconspicuously coloured. One species, which is

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1. *Id., ibid.*, 1905 (I), p. 40, pl. ii, fig. 5.



attached to the appendages of *Limulus*, is probably no more than an occasional and involuntary visitor to the lake-system; another lives on mollusc shells inhabited by hermit-crabs, while a third was dredged apparently unattached. None of these species are probably related to the characteristic forms of Indian backwaters and estuaries.

Large Medusae of various families are often carried into the mouth of the lake by tidal currents, but soon perish in brackish water, in which the only species that survive, so far as the Talé Sap is concerned, are small and colourless. One of these is the medusae of *Campanulina ceylonensis*, the life-history of which was recently worked out at Calcutta by Major R. E. Lloyd.<sup>1</sup> It is a marine form that can live in water of comparatively low salinity and is therefore able to make its way inland in the delta of the Ganges for considerable distances.

Only two Hydroids were observed in the Talé Sap, a species of *Perigonimus*, which forms shaggy and conspicuous fringes on fishing-stakes, and a small and transparent Campanulariid, not uncommon on the shells of molluscs and on dead palm leaves that had fallen into the water.

The fauna of the outer lake of the Talé Sap system is thus that of a true marine lake and is strictly comparable with that of the Chilka Lake. Very little is at present known about seasonal changes in physical conditions in the Talé Sap, but it is clear that considerable differences in respect to such changes exist between it and the Chilka Lake. Variation in salinity, for example, seems to be even more inconstant in the Talé Sap, and the fact that the rivers which enter it do so at intervals along the whole length of one side, rather than only in a comparatively small area at one end, must have considerable bearing on this point. Generally speaking, the fauna of the outer lake resembles that of the outer channel of the Chilka Lake, but there are important differences that cannot be fully estimated as yet, and only a comparatively small number of the species are identical. I hope to publish later, when at any rate the greater part of my collections have been worked out by specialists, a fuller account

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<sup>1</sup> Lloyd, *Rec. Ind. Mus.*, vol. XII, pp. 52-57, pls v-vii (1916).



of the main biological features of this interesting lake-system, but it is clear that no complete account can be prepared until observations have been made at different seasons and for considerable periods.

In preparing this preliminary report I have been much indebted for assistance to Mr. S. W. Kemp, Superintendent in the Zoological Survey of India, who has identified the majority of the Crustacea mentioned, and also to Dr. B. L. Chaudhuri, Assistant Superintendent in the same department, who has helped me greatly in naming the fishes.



## DESCRIPTION OF A NEW FROG FROM SIAM.

BY G. A. BOULENGER, LL.D., D.Sc., F.R.S.

WITH A PLATE

AND A NOTE BY THE COLLECTOR.

***Rana pileata*, sp. n.**

Vomerine teeth in two oblique series converging behind, originating on a line with the hinder edge of the choanae. Lower jaw with two fang-like bony prominences in front, in the males. Head, moderate in the females, very large in the males, a little broader than long; in the males, strong swellings are formed on the lower surface of the mandible and on each side of the occiput by the extraordinary development of the masseteric and depressor muscles; snout short, obtuse; canthus rostralis obtuse, loreal region oblique; interorbital region little broader than the upper eyelid in females and half-grown males, twice as broad and very convex in full-grown males; in these the frontoparietals form a swelling as in *Pelobates fuscus* and *Rana plicatella*; behind the interorbital region a large dermal flap in the full-grown males, rounded and completely detached behind; in smaller males this flap less developed and in females and young it is absent or represented by a faint semicircular fold; tympanum distinct,  $\frac{3}{4}$  or  $\frac{4}{5}$  the diameter of the eye in females, quite as large as the eye in adult males. Fingers moderate or rather short, blunt, first extending a little beyond second; toes moderate, nearly entirely webbed, the tips dilated into small disks; a feeble cutaneous fringe along the outer side of the fifth toe; sub-articular tubercles moderate; inner metatarsal tubercle blunt, elongate,  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle; a feeble tarsal fold. The tibio-tarsal articulation reaches the eye; tibia about  $\frac{1}{2}$  the length of head and body, a little shorter than the fore limb and nearly as long as the foot. Skin with irregular, flat glandules on the back and small tubercles on the upper eyelid; a strong fold from the eye to the shoulder.

Green, olive, or brown above, young and half-grown often with a strong tinge of red, with darker spots or marblings, or with dark edges to the dorsal glandules; a more or less distinct yellowish angular band, dark-edged behind, between the eyes; lips with dark



vertical bars; as in many species of *Rana*, some specimens have a yellow median stripe, extending from the tip of the snout to the vent; limbs with dark cross-bars. Lower parts white or pale yellow, throat sometimes spotted with brown. Iris golden-green, veined with black and with a black cross.

This species agrees very closely with *R. doriae*, in which the males also show an enlargement of the head and a swelling on the posterior part of the interorbital region, as I have described and figured in Ann. Mus. Genova (2) XIII, 1893. p. 328, pl. VIII. fig. 1, thus foreshadowing the condition in *R. pileata*.

However there is no flap, and this extraordinary development appears to justify the establishment of a new species, although it is not impossible that the future discovery of intermediate specimens may necessitate the degradation of the species to varietal rank, so close is the agreement in other respects. The only characters which can be adduced as distinctive of *Rana pileata*, apart from the flap, are the greater interorbital width in males, and the shorter inner metatarsal tubercle as compared with the inner toe, the measurements of adult male and female *R. doriae*, 57 and 55 mm. long from snout to vent being. 4 mm. for the tubercle, and 6 for the toe.

Measurements of four specimens (in millimetres).

	$\sigma$			$\varphi$ (1)
From end of snout to vent	72	61	51	52
Length of head .....	31	27	20	19
Width of head.....	33	30	23	20
Length of snout.....	11	10	8	7
Diameter of eye .....	8	7	6	5
Width of upper eyelid.....	4	4	4	4
Interorbital width .....	9	7	5	4.5
From eye to tympanum.....	8	6	3	3
Diameter of tympanum .....	8	7	5	4
Fore limb.....	40	36	30	29
Hand.....	17	17	15	14
Hind limb.....	107	98	85	82
Tibia .....	35	32	28	26
Foot.....	31	31	27	26
Inner toe.....	9	8	7	6.5
Inner metatarsal tubercle....	3	4	3.5	2.5

(1) With ripe ova measuring 3 mm. in diameter.







EXPLANATION OF PLATE.

*RANA PILEATA.*

- a. Full-grown male, upper view.
- b. „ „ „ side view of head.
- c. Half-grown male, upper view of head and anterior part of body.
- d. Female, upper view.
- e. Open mouth.

All figures of the natural size.



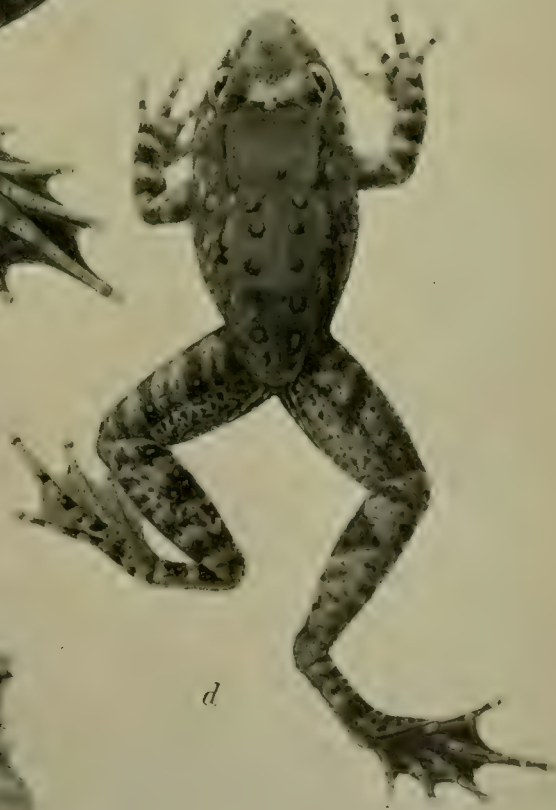


a

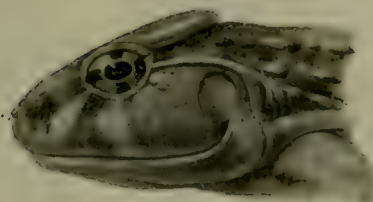
c



e



d



b







As in *R. doriae*, the males have no vocal sacs, and they show no thickening of the inner finger or nuptial rugosities.

This species is described from a series of specimens from Khao Sebab, Chantabun, S. E. Siam, also one male from the Me Song forest, near Prae, N. Siam, for which I am indebted to Dr. Malcolm Smith. I had previously received from him a small male from Hup Bon, Sriracha, S. E. Siam, which I was inclined to refer to *R. plicatella*, which shows a knob-like prominence behind the interorbital region, likewise broader than the upper eyelid; but no dermal flap is known to be ever developed in that species, which is, besides, distinguished by the presence of 8 to 10 glandular longitudinal folds on the back.

[This frog has a wide distribution in Siam, and so far has been only found on the hills. On Khao Sebab\* it was exceedingly common, living on the banks of the numerous small streams with which this hill is supplied. It was found at all elevations, and above 2000 feet, was the only batrachian met with during our short stay there. Hup Bon, some 80 miles to the N. E., is about 600 feet above sea-level, but is not a hill. It is evidently rare there, as I could never obtain any more specimens from that locality. On the hills north of Utradit (Khao Pleung) and also on those north of Prae (Me Song forest) it was again found to be plentiful.

On Khao Sebab at the end of March, many young ones just emerging from the water were met with, and females with ripe ova were also obtained. I brought several adults back with me on that occasion, and they are still thriving (November), living on the usual frog diet. The flap on the head is, presumably, for sexual ornamentation. It is not erectile, and in life is kept closely applied to the head. M.A.S.]

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\* Khao = hill. Alt. 3000 ft.



## THE BUTTERFLIES OF SIAM.

BY E. J. GODFREY, B. SC., F. E. S.

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The following list, I believe, includes the names of all butterflies which at present are known from Siam.

Several butterflies sent to the British Museum in 1914 and some forty others obtained during a recent trip to the North of Siam have not yet been worked out, but even with these additions the list cannot by any means be considered complete, for there are still many parts of the country—the North particularly—which are practically unknown entomologically.

Collectors were at work in the country as far back as 1770, for *Clerome arcesilaus* was described by Fabricius from Siam in that year.

A list\* of the butterflies obtained by M. Pavie during the course of his travels in Indo-China (1879-1895) includes the names of several from Siam.

H. H. Druce was in the country in 1874, and W. H. Doherty in 1891.

Dr. Erick Haase, who was at one time Curator of the Bangkok Museum, collected in and around Bangkok from 1891 to 1893.

Herr Fruhstorfer, who with several trained collectors visited Siam in 1900 and again in 1901, obtained a large number of the butterflies of the country, many of which he is now describing under subspecific rank in Seitz's "*Macro-lepidoptera of the World.*"

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\* Mission Pavie. Indo-Chine. Études Diverses. III. L'Histoire Naturelle. p. 222, et seq



My own experience in the country extends over the last seven years.

During these years I have collected in my spare time in the following localities :—

- I. IN CENTRAL SIAM : The Bangkok district and the country to the north as far as Lopburi.

The City of Bangkok is situated on both banks of the Menam Chao Praya in latitude 13°. 45' N and longitude 100°. 30' E. On the west bank it is bounded by fruit gardens, on the east bank by padi plains. The mean level of the city is only from 4 to 6 metres above sea-level. The city itself is thickly interspersed with fruit gardens.

- II. IN SOUTH-EASTERN SIAM : The Sriracha district.

This district includes a strip of dry, sandy, open jungle extending along the sea-shore, and an inland forest area which rises steadily to a height of about 200 metres. With the exception of a few clearings and plantations this area is all dense evergreen forest. The soil is sandy throughout, and few running streams are to be found. The area is bounded on the east by granite mountain ridges ranging from 300 to 600 metres in height. Nong Yai Boo, Ban Dan, Nong Khor, Nong Khai Ploi and Hup Bon are in this district.

- III. IN WESTERN SIAM : The country near Kang Kra Chang on the Petchaburi River up to a height of about 190 metres.

This district consists of dense forest and jungle, the only open spaces in the area being the small cultivated patches around one or two small native settlements. The jungle is for the most part damp and evergreen, with perennial streams running in the valleys. The district is bounded on the north and west by mountain ridges ranging from 900 to 1150 metres in height, and on the east by an intermediate area of less mountainous country which divides the true mountains from the plains, and which is covered with mixed evergreen and deciduous jungle.

- IV. IN EASTERN SIAM : At Hinlap, Muak Lek, Pak Jong and Chanteuk on the Dong Rek range.

The jungle near these places is mostly evergreen, but around



the villages themselves there is a good deal of deciduous scrub forest of more or less recent growth, covering ground which at some former period was under cultivation.

V. IN NORTHERN SIAM: The Me Song forest.

This forest is situated some 26 miles due north of Præ, and is watered by the Me Song and its tributaries the Me Lem, the Me Tan, and the Me Sai Song. A great deal of the forest is evergreen, but there is also pure bamboo jungle, mixed tree jungle and "paa" or laterite jungle.

VI. IN PENINSULAR SIAM: The Singgora district.

The geographical divisions used are those proposed by Mr. C. Boden Kloss in this Journal (Vol. 1, p. 250).

I am indebted to the Authorities of the British Museum for free access in 1913 to the collections and library contained in the Natural History Museum at South Kensington.

I have also to thank Herr Fruhstorfer for going through my collection with me at the South Kensington Museum in 1913, and for sending me notes on various Siamese butterflies unknown to me at that time.

But above all, my warmest acknowledgments are due to Mr. N. D. Riley for the generous help he has accorded me in the identification of doubtful species and in the description of some new forms.

In nomenclature I have followed Seitz as far as possible, and in many of my notes I have quoted from the same authority.

FAMILY—PAPILIONIDÆ.

1. *PAPILIO ÆACUS ÆACUS* Fldr.

Widely distributed and fairly common. It frequents gardens in Bangkok, visiting by preference the flowers of *Ixoras*. It also seems partial to the flowers of the Flame-of-the-forest (*Poinciana regia*). At Sriracha, I once saw a whole row of these trees swarming with the males and females of *æacus*. The trees were in full bloom at the time, and the combined effect of the masses of vivid scarlet blossoms, with the numerous conspicuous butterflies hovering over them was distinctly pleasing.

*P. æacus* is known to the Siamese as "pee sîa yāk" which



means "the giant butterfly"; it is the only butterfly in the country which has a distinctive name.

2. *PAPILIO ZALEUCUS* Hew.

A few specimens of this butterfly were taken at Hup Bon in April and May 1914.

3. *PAPILIO ADAMSONI* Grose-Smith.

I took four specimens of this rare butterfly on the Petchaburi River in 1910, but I have not come across it since.

4. *PAPILIO PHILOXENUS POLYEUCTES* Dbldy.

Recorded by Jordan from North Siam (Seitz, *Macro-lep.* 9, p.32.)

5. *PAPILIO ARISTOLOCHIAE GONIOPELTIS* Rothsch.

Widely distributed and fairly plentiful everywhere.

6. *PAPILIO SLATERI MARGINATA* Oberth.

According to Jordan (*Seitz, Macro-lep.* 9, p. 41.), this race occurs in Central Siam in South Tonkin and the Shan States. *Cnephas* Jord. is an aberrant female form from the lower Shan States.

Bingham gives *tuoyanus* Btlr. as the Siamese race, but Jordan restricts this to Tenasserim.

I have not yet come across either form.

7. *PAPILIO CLYTIA* Linn.

The following forms of this very variable species occur in Siam:—

CLYTIA Linn.

PANOPE Linn.

PAPONE Westw.

JANUS Fruhst.

ONPAPE Moore.

DISSIMILIS Linn.

The *dissimilis* form is now recorded for the first time; the others have already been cited by Jordan. The *janus* form is unknown to me in nature. According to my observations, *clytia* is by far the commonest form in Siam.

Jordan regards all these forms, which were formerly recognized as species, as geographical races in the making.

8. *PAPILIO PARADOXA TELEARCHUS* Hew.

I took a single specimen of this butterfly on the Petchaburi River in April 1910, but have not met with it since.

9. *PAPILIO CASTOR MAHADEVA* Moore.

Not common. Taken only on the Petchaburi River in the month of April and at Muak Lek in July.



10. *PAPILIO DEMOLEUS MALAYANUS* Wall.

Common everywhere all the year round.

11. *PAPILIO DEMOLION DEMOLION* Cr.

Not uncommon in the Sriracha district, but rare in other parts of the country.

12. *PAPILIO CHAON CHAON* Westw.

Fairly common in all forest areas. Often found in numbers at wet places in waterless beds of streams and in jungle paths.

13. *PAPILIO HELENUS HELENUS* Linn.

Is found in the same localities as the preceding, but is not so common.

14. *PAPILIO HIPPOUS PITMANI* Elw.

I took a few specimens of both sexes of this butterfly on the Petchaburi River in April 1910, but have not come across it since.

Two of these specimens are now in the British Museum and are the only examples of *pitmani* they have.

The type of *pitmani* came from the hills of South Tenasserim below Tavoy, and it is only natural that specimens taken on the Petchaburi River should be of that form.

In Eastern Siam, however, *pitmani* is replaced by the following:—

15. *PAPILIO HIPPOUS SIAMENSIS*, subsp. nov.

Resembles *P. h. pitmani* on the upperside but differs from it on the underside as follows:—

(1). The discal band is pure white, not creamy.

(2). The lunular submarginal spots instead of being small and uniformly brown are larger, brown centrally, paler externally and show a marked tendency to fuse at their ends with the white marginal spots, especially in interspaces 4-7.

Types from Pak Jong in the British Museum.

Common on the Dong Rek hills, especially at Pak Jong where over thirty specimens were obtained in February.

16. *PAPILIO POLYTES POLYTES* Linn.

Common everywhere all the year round.

17. *PAPILIO MEMNON AGENOR* Linn.

Males fairly common everywhere, females rare.



The females in my collection are ♀-f *distantianus* Rothsch.

Jordan states that the males of *memnon* never visit puddles or moist spots on the ground, but I have frequently found them at such places both on the Petchaburi River and in the Sriracha forest.

Near one of my camping places on the Petchaburi River was a moist "salt-lick" much frequented by deer which swarmed with butterflies throughout the day. Here *P. m. ajenor* was a very frequent visitor, and the moist soil seemed to have such an attraction for it that it was often quite easy to take specimens with the fingers.

18. *PAPILIO PROTECTOR EUPROTECTOR* Fruhst.

Rare. Three males taken on the Petchaburi River in April 1910.

19. *PAPILIO POLYCTOR TRIUMPHATOR* Frusht.

Taken by Fruhstorfer at Chantabun. I have not yet come across it.

20. *PAPILIO PARIS PARIS* Linn.

Fairly common in all forest areas.

21. *PAPILIO PALINURUS PALINURUS* Fabr.

A single male was taken on the Petchaburi River in April 1910.

22. *PAPILIO AGETES AGETES* Westw.

I took a few specimens of this butterfly on the Petchaburi River in April 1912, but have not come across it since.

23. *PAPILIO NOMIUS SWINHOEI* Moore.

24. *PAPILIO ARISTEUS HERMOCRATES* Fldr.

This butterfly and the preceding are common in all forest areas. Vast numbers of both were seen in April 1912 at the Siamese Survey Camp in the Huey Meh Pradone in N. Lat 13° and E. Long 99° 30'.

They were present in all the numerous groups of butterflies around the camp, but seemed to foregather by preference with other Papilios, particularly *P. nicaeus indochinensis* and *P. megarus similis*. In addition to those around the camp, vast crowds were flying down stream throughout the day.

25. *PAPILIO ANTIPHATES POMPILIUS* Fabr.

This butterfly was fairly common on the Petchaburi River in April 1910, but I have seldom come across it since.

26. *PAPILIO PAYANI* subsp ?



A single specimen which I identify as belonging to this species was obtained in the Me Song forest, Prae, in April 1916.

It is probably referable to the race *amplis* FRUHST, from Tenasserim and Burma, but I know this only from Fruhstorfer's description.

27. *PAPILIO SARPEDON SARPEDON* Linn.

Fairly common everywhere all the year round.

28. *PAPILIO DOSON AXION* Fldr (= *euryplus*, HBN. nec LINN., actor FRUHST.)

Common everywhere all the year round.

Congregates in swarms at wet places on the ground in the dry months.

29. *PAPILIO EURYPLUS CHERONUS* Fruhst.

I have only two specimens of this butterfly—both taken in the Sriracha forest—but it is probably much more common than would appear from this.

Jordan separates *euryplus* from *doson* on differences in the male genitalia and mentions a certain difference in the markings of the underside by which the two species may usually be differentiated.

30. *PAPILIO BATHYCLES* Zink.

Recorded from Siam by Bingham (Faun. Br. Ind., Butterflies, Vol. II, p. 108.)

This is probably referable to the race *chiron* Wall., which has been recorded from the Shan States.

31. *PAPILIO AGAMEMNON AGAMEMNON* Linn.

Widely distributed and fairly common.

32. *PAPILIO ARYCLES ARYCLEOIDES* Fruhst.

Apparently very rare. Two males taken at Nong Khor in April 1911.

The only other example known is the type specimen which was taken by Fruhstorfer at Muak Lek.

33. *PAPILIO MACAREUS INDOCHINENSIS* Fruhst.

Common in most forest areas.

An example of the aberration *argentiferus* FRUHST. was taken on the Petchaburi River in April 1912.

34. *PAPILIO XENOCLES LINDOS* Fruhst.

I took seven males of this butterfly on the Petchaburi River in



April 1913, but have not come across it since.

Jordan restricts the race to Siam and says "only a few ♂♂ are known".

35. *PAPILIO MEGARUS SIMILIS* Lathy.

Common in most forest areas.

I have one very aberrant male, taken on the Petchaburi River in April 1912, in which the streaks of the forewing are almost completely absent.

36. *LEPTOCIRCUS CURIUS CURIUS* Fabr.

Not common. Taken only at Muak Lek and Pak Jong.

37. *LEPTOCIRCUS MEGES VIRESCENS* Btlr.

Fairly common in the Sriracha forest, and not uncommon in other forest areas.

*FAMILY—PIERIDÆ.*

38. *LEPTOSIA XIPHIA XIPHIA*. Fabr.

Common everywhere all the year round.

39. *DELIAS AGOSTINA* subsp.?

A single male which I identify as belonging to this species was obtained in the Me Song forest, Præ, in April 1916.

It is probably referable to the race *infumata* FRUHST. from Assam and Tenasserim, which I know only from Fruhstorfer's figure.

40. *DELIAS HYPARETE CIRIS* Fruhst.

Quite common everywhere. Very plentiful in temple gardens in Bangkok in December, January and February.

41. *DELIAS BELLADONNA* Fabr.

Recorded from Siam by Bingham (Faun. Br. Ind., Butterflies. Vol. II, p. 148.) Race unknown.

42. *DELIAS DESCOMBESI LEUCACANTHA* Fruhst.

I have met with this butterfly in all parts of Siam but nowhere in great numbers.

Fruhstorfer, however, writing of the race, says:—

"The butterflies are common in the whole region, fly all the year round, in Siam in January in enormous numbers, and adorn even the parks in the large towns, such as Bangkok and Saigon with their bright colours and the dazzling white of the upper side, floating slowly



underneath the shady trees in company with *Delias hyparete ciris*."

43. *DELIAS AGLAIA THYRA* Fruhst.

Not common. Taken only in the Sriracha district and the Me Song forest.

44. *DELIAS THYSBE* Cr.

Recorded from Siam by Bingham (Faun. Br. Ind., Butterflies, Vol. II, p. 148.)

Probably referable to the race *pyramus* WALL. from Burma and the Malay Peninsula.

45. *PRIONERIS THESTYLIS JUGURTHA* Fruhst.

Rare. A few specimens taken on the Petchaburi River in April 1910.

46. *PRIONERIS CLEMANTHE HELFERI* Fldr.

Recorded from Siam by Fruhstorfer (Seitz, Macro-lep. 9, p. 137.) I have not yet come across it.

47. *PIERIS CANIDIA* Sparr.

A single specimen taken in the Me Song forest, Prae, in April 1916.

48. *HUPHINA NERISSA DAPHA* Moore.

Common everywhere all the year round.

According to Fruhstorfer, *dapha* is the race which occurs in Tenasserim, Burma and Siam, but I have two specimens in my collection which appear to me to be typical *nerissa*.

49. *HUPHINA NADINA NADINA* Luc.

This in its various seasonal forms is common everywhere.

According to Fruhstorfer, *nadina* is the wet-season form, *nama* MOORE an intermediate form and *amba* MOORE an extreme dry-season form.

50. *HUPHINA LEA SIAMENSIS* Btlr.

Widely distributed and quite common. May be found in nearly all the crowds of butterflies which, in many parts of the country, are so commonly seen at wet places on the ground in the dry months.

The race is peculiar to Siam.

51. *APPIAS LIBYTHEA ZELMIRA* Cr.

Common everywhere all the year round.



*Sopara* FRUHST. is a rainy-season form found in Siam and Assam.

52. *APPIAS LYNCIDA HIPPOIDES* Moore.

Widely distributed and not uncommon.

53. *APPIAS NERO GALBA* Wall.

Widely distributed and fairly common, especially in the Sriracha forest.

The males congregate with other Pierids at moist places on the ground, but, according to my observations, the females are only found singly in the woods.

54. *APPIAS INDRA THRONION* Fruhst.

Described from Siam by Fruhstorfer (Seitz, Macro-lep. 9, p.153.)

55. *APPIAS LALAGE ARGYRIDINA* Btlr.

Recorded by Fruhstorfer from "Siamese Shan States" (Seitz, Macro-lep. 9, p. 153.)

56. *APPIAS ALBINA CONFUSA* Fruhst. (= *darada* auct. nec *Fldr*).

Widely distributed and fairly common.

Fruhstorfer distinguishes between two female forms which he calls *principalis* and *semiflava* respectively.

57. *APPIAS MELANIA PSEUDOLEIS* Fruhst.

Very common in the Sriracha district, and quite plentiful in other parts of the country.

Fruhstorfer restricts this race to Siam.

58. *IXIAS PYRENE VERNA* Druce.

Common everywhere all the year round.

59. *DERCAS VERHUELLI* Hœv.

Recorded from Siam by Bingham. (Faun. Br. Ind., Butterflies, Vol. II, p. 226.)

60. *CATOPSILIA CROCALE CROCALE* Cr.

Very common everywhere all the year round.

61. *CATOPSILIA POMONA* Fabr.

Occurs with *C. coocale*, but is not so common. The aberrant form *catilla* is not uncommon.

62. *CATOPSILIA PYRANTHE* Linn.

Very common everywhere all the year round,

63. *CATOPSILIA FLORELLA* Fabr.



Bell (Journ. Bomb. N. H. S., Vol. XXII, p. 523.) records this butterfly from Siam.

64. *CATOPSILIA SCYLLA SIDRA* Fruhst.

Very common in Bangkok in December, January and February, but not common elsewhere.

65. *TERIAS VENATA* Moore.

A single specimen taken in Bangkok in January.

66. *TERIAS LAETA PSEUDOLAETA* Moore.

A male taken in Bangkok in February, and a male and a female at Pak Jong in January.

67. *TERIAS HECABE HECABE* Linn.

Common everywhere all the year round.

68. *TERIAS BLANDA DAVIDSONI* Moore.

Occurs in most localities, but is not very common.

69. *TERIAS LACTEOLA LACTEOLA* Dist.

Taken by Fruhstorfer in Siam.

I have not yet found it.

70. *GANDACA HARINA BURMANA* Moore

Widely distributed and fairly common.

71. *HEBOMOIA GLAUCIPPE* subsp. ?

Males common everywhere, females rare.

I am unable at present to refer this to any particular race.

72. *PARERONIA VALERIA HIPPIA* Fabr.

Fairly common everywhere.

Females with a brilliant orange-yellow tinge on the cell and anal part of the hind wing are *philomela* MOORE. Fruhstorfer says these are rare, but I taken them in many parts of Siam, at Pak Jong (E. Siam) in particular.

73. *PARERONIA AVATAR PARAVATAR* Bingham.

A number of specimens of both sexes were obtained at Pak Jong in January.

I identify this butterfly from Fruhstorfer's figure of the female with which my specimens agree almost exactly, but I have not yet had an opportunity of comparing it with typical examples.

Hitherto, *paravatur* has been recorded only from Tenasserim.



It apparently differs from *H. v. hippia* in the fact that it keeps to the woods and is not found in open country.

*FAMILY--NYMPHALIDÆ.*

*SUB-FAMILY---DANAINÆ.*

74. *HESTIA LEUCONÖE SIAMENSIS*, subsp. nov.

Resembles *H. leuconöe nigriana* GROSE-SMITH from Borneo. Differs as follows:—The ground colour much paler, the yellow tinge more pronounced. The zig-zag mark crossing the cell of the forewing and the spot below it, in interspace 11, reduced in size; the spot below the cell, in interspace 2, absent.

Not uncommon at Nong Khor and Hup Bon in the Sriracha forest, but apparently not found elsewhere. According to my observations, the butterflies keep mostly to the tops of trees, especially in the early mornings, but they occasionally circle slowly down with clumsy, top-heavy, movements and are then easily captured.

Types 2 ♂♂, 1 ♀ in the British Museum.

75. *HESTIA HADENI* W-M. and de N.

There is a specimen in the British Museum labelled "Bangkok. Siam," but Frushstorfer says the species is very rare, and has only been found as yet near Bassein at the estuary of the Irawaddi.

76. *DANAIS PLEXIPPUS PLEXIPPUS* Linn.

Common everywhere all the year round.

According to Frushstorfer, *intermedia* MOORE is a dry season aberration which occurs together with *plexippus typica*, in Siam, Cochin China and Tonkin.

77. *DANAIS CHRYSIPPUS CHRYSIPPUS* Linn.

Common everywhere all the year round.

78. *DANAIS MELANIPPUS HEGESIPPUS* Cr.

Widely distributed and fairly common.

79. *DANAIS AFFINIS MALAYANA* Fruhst.

Taken only on the west bank of the river in Bangkok and at Sriracha.

The occurrence of this butterfly at Sriracha is of interest. Frushstorfer (1910) writes: "*malayana* FRUHST. a highly specialized form almost worthy of specific rank, of which for a decade only ♂



was known and whose locality, the Malay Peninsula, was moreover still doubtful. But I found the species fairly plentiful in Bangkok, where this beautiful form was not rarely to be met with on the right bank of the Menam on flowers and grasses in the extensive temple gardens near the canals. Thus *affinis*, the most variable of all the Asiatic Danaida, has also reached the continent and will certainly extend still further along the sea-coast of Siam."

80. DANAIS MELISSA SEPTENTRIONIS Btlr.

Common everywhere all the year round.

This butterfly often congregates in numbers at moist places on the ground in the extreme dry months; it is the only Danaid I have ever found doing so.

81. DANAIS LIMNIAE LIMNIAE Cr.

Not very common. Taken only on the Petchaburi River and in the Sriracha forest.

82. DANAIS ASPASIA ASPASIA Fabr.

Common in the Sriracha forest and not uncommon in other forest areas. Fruhstorfer says that the type of *aspasia*, preserved at the British Museum since 1787, probably came from Siam.

83. DANAIS ERYX ERYX Fabr.(=*agleoides* FLDR.)

Common in Bangkok and the adjacent country.

Fruhstorfer says that the type of this butterfly also probably came from Siam, whence Fabricius obtained many species.

84. DANAIS AGLEA MELANOIDES Moore.

Widely distributed and fairly common.

85. DANAIS MELANEUS PLATANISTON Fruhst.

Not common. Taken only at Hup Bon and in the Me Song forest, Prae, in April.

86. DANAIS SIMILIS PERSIMILIS Moore.

Common everywhere, especially in Bangkok and the country districts round about. This race is found only in Siam. Moore's types of *persimilis* came from Petchaburi.

87. EUPLŒA MODESTA MODESTA Btlr.

A very common butterfly in Siam. Occurs in swarms almost everywhere from January to March.

Vast numbers of *E. m. modesta*, together with smaller numbers



of *E. h. harrisi*, *E. m. mulciber* and *E. midanus chloë*, were seen in January 1914 on a hill-side about five kilometres from the village of Pak Jong on the Dong Rek range. Not only were the butterflies massed on the trunks of the trees, but they were on almost every branch and twig. They hung in long rows from the lower bushes, and even the lowest undergrowth swarmed with them. On some trees they seemed to form part of the foliage; on others, they looked more like clusters of berries. From time to time they rose in clouds from a tree or bush, only to settle down again almost immediately. Males preponderated. Numerous pairs were *in copula*. Individuals on the bushes could be taken quite easily with the fingers, in fact, the native bark-collector who conducted me to the hill embarrassed me somewhat by bringing me living specimens in handfuls. The forest for some kilometres on either side of the hill was very dense, but the hill itself was fairly open, having evidently been partially cleared at some former period. The man said that the butterflies had been there for some days, but he could not remember having seen similar swarms in former years. I visited the hill-side on almost the same date in the following year, but not a single Euploeid was to be seen there. It is interesting to note that Ribbe who met with swarms of *E. nechos* under very similar conditions on the small Solomon Island, Munia, learned from the natives that such swarms occurred there periodically, about every ten years.

88. EUPLOEA GODARTI Luc. (= *siamensis* FLDR.)

Another very common Euploeid which is even more widely distributed than *E. m. modesta*. It is particularly plentiful in Bangkok gardens in the dry months from January onwards. Individuals with no violaceous-white patch at the apex of the forewing are known as *layardi* DRUCE. (= *subdita* MOORE). According to my observations, this form is not very common in Siam. Bingham treated *godarti* and *layardi* as separate species; Fruhstorfer unites them. *Tonkinensis* SWINH. is the name given to an aberration corresponding to *layardi*, from examples taken by Fruhstorfer in Siam, in which even the white costal and subapical spots of the forewing are wanting.

Moore's types of *subdita* and the types of *siamensis* and *layardi* all came from "Lower" Siam. As Fruhstorfer remarks, it is to be re-



gretted that Felder's name cannot stand, for *godarti* is one of the most characteristic butterflies of Siam.

89. *EUPLŒA CAMARALZAMAN* Btlr.

Taken only on the Petchaburi River, and at Pak Jong and Muak Lek. The females are very uncommon.

This beautiful species is found only in Siam and South Tenasserim, and is distinctly rare. The type came from Chantabun (S. E. Siam).

90. *EUPLŒA ORONTOBATES* Fruhst.

Unknown to me. Described by Fruhstorfer as "a transition from *godarti* to *modesta* Btlr. and *camaralzaman*, having the same shape and size as the latter, but the wonderful blue reflection absent."

Described from a single male taken by Fruhstorfer at Chantabun (S. E. Siam).

91. *EUPLŒA ALCATHOË ÆSATIA* Fruhst.

Not common. A few specimens taken on the Petchaburi River in April, and at Pak Jong in January. Fruhstorfer restricts this race to Siam and Lower Burma.

92. *EUPLŒA DIONE LIMBORGI* Moore.

Not very common. Taken only in the Sriracha district and in the Dong Rek hills.

93. *EUPLŒA HARRISII* HARRISI Fldr.

Widely distributed and fairly common. *Depunctata* FRUHST are examples from Siam without whitish submarginal spots on the forewing.

94. *EUPLLŒA MULCIBER MULCIBER* Cr.

Fairly common everywhere.

95. *EUPLŒA CORUS DRUCEI* Moore.

A single specimen taken at Sriracha in April 1911.

This butterfly is known only from Siam, and is apparently very rare. It was described from Chantabun. Fruhstorfer says that it may be the dry-season form of *E. corus phæbus* Btlr.

96. *EUPLŒA LEUCOSTICTOS LEUCOGONYS* Btlr.

Three males taken on the Petchaburi River in April 1912, two females at Pak Jong in January 1914.

97. *EUPLŒA MIDANUS CHLOË* Guér (= *margarita* BTLR).



Widely distributed and fairly common. According to Fruhstorfer, *brahma* MOORE is an extreme dry season form in Siam, *chloë* (*margarita*) an intermediate form, whilst true *milanus* LINN. occurs casually as an aberration.

98. EUPLEA KLUGI CRASSA Btlr.

Widely distributed and quite common. Plentiful in Bangkok gardens in the dry months from January onwards.

99. EUPLEA DIOCLETIANUS DIOCLETIANUS Fabr.

Common everywhere especially in the Sriracha district.

This butterfly seems to be very fond of the smell of charred wood. At Sriracha I have frequently found it, together with *Danaïs aspasia aspasia* assembled in long rows on charred tree trunks, or clustered on heaps of wood ashes.

SUB-FAMILY—SATYRINÆ.

100. YPETHIMA HUEBNERI HUEBNERI Kirby.

Two specimens taken at Sriracha in September, and one in April.

101. YPETHIMA AVANTA AVANTA Moore.

Two specimens taken at Sriracha in April and two in September.

102. YPETHIMA BALDUS BALDUS Btlr.

Common everywhere all the year round.

103. ERITES ANGULARIS ANGULARIS Moore.

This butterfly was not uncommon in the Me Song forest, Præ, in April 1916, but I have not met with it elsewhere in Siam. Fruhstorfer obtained it near Kanburi in April.

104. LETHE EUROPA NILADANA Fruhst.

Widely distributed and not uncommon. *Gada* FRUHST is an extreme dry season aberration which, according to Fruhstorfer, occurs in Siam and Tonkin.

105. LETHE MINERVA subsp.?

A few specimens of both sexes taken in the Me Song forest, Præ, in April 1916. This is probably referable to the race *tritogenia* FRUHST. from Tenasserim.

106. LETHE MEKARA subsp.?

Taken sparingly in the Me Song forest, Præ, in April 1916.

This appears to be very near *crijnana* FRUHST. as figured by Fruhstorfer.



107. *LETHE ROHRIA* subsp. ?

A few specimens taken in the Me Song forest, Prae, in April 1916. The specimens agree very closely with examples labelled "*L. confusa*" which I have received from India. Fruhstorfer regards *confusa* as a synonym of *rohria*.

108. *ANADEBIS DIADEMOIDES BATMARA* Fruhst.

A single example taken in the Me Song forest, Prae, in April 1916. I have identified this butterfly from Fruhstorfer's figure with which my specimen agrees almost exactly.

109. *CÆLITES NOTHIS NOTHIS* Bdv.

Two very worn specimens taken at Muak Lek in January and four others, also in poor condition, on Khao Seabap, Chantabun, in March. Judging from these captures, the butterfly would appear to be rare. Fruhstorfer, however, seems to have found it more common for he writes :— "the butterflies flew there (i. e. in Siam) only in the afternoon and for a short time, and presented a weird appearance with their colours flashing out just momentarily," This race is known only from Siam.

110. *MYCALESIS PERSEUS PERSEUS* Fabr.

Widely distributed and quite common.

111. *MYCALESIS MINEUS* Linn.

Common everywhere all the year round.

112. *MYCALESIS PERSEOIDES PERSEOIDES* Moore.

Common everywhere all the year round.

113. *MYCALESIS ANAXIAS ÆMATE* Fruhst.

Three specimens taken at Hup Bon in April 1914.

114. *MYCALESIS ANAXIOIDES* Marsh. (?)

A few specimens which I doubtfully identify as belonging to this species were obtained in the Me Song forest, Prae, in April 1916.

115. *MYCALESIS MYSTES* de N.

One male of this rare butterfly was obtained at Siiracha in April 1911, and two others at Hup Bon in April 1914.

116. *ORSOTRIÆNA MEDUS* Fabr.

Common everywhere all the year round.

117. *MELANITIS LEDA ISMENE* Cr.

Common everywhere all the year round.



118. *MELANITIS ZITENIUS* subsp.?

Two specimens taken at Sriracha in May.

## SUB-FAMILY—ELYMNINÆ.

119. *ELYMNIAS DARA* subsp.?

Two females which I identify as belonging to this species were obtained in the Me Song forest, Præ, in April 1916. It is probably referable to the race *daedalion* which is known from Burma and Tavoy in Tenasserim.

120. *ELYMNIAS HYPERMNESTRA UNDULARIS* Drury.

Fairly widely distributed, but nowhere very common except in Bangkok where it is quite plentiful, especially in December, January and February. In Siam there are two well-marked seasonal forms which Fruhstorfer has named *violetta* and *epixantha* respectively.

121. *ELYMNIAS NESÆA APELLES* Fruhst.

I have taken a number of males and females of this butterfly in Bangkok mostly in December, January and February, but have not come across it elsewhere. This fine subspecies was described by Fruhstorfer from two males taken by him in Bangkok in 1900. In the females, the streaks on the forewing are greenish-grey, not blue, and the ground colour of the hindwing is dark chestnut-brown.

122. *ELYMNIAS MALELAS IVENA* Fruhst.

This butterfly was described by Fruhstorfer from examples taken by him in Tonkin and Siam. I have only two specimens, both females, one taken in Bangkok in December, and the other at Pak Jong in January.

123. *ELYMNIAS VASUDEVA OBERTHURI* Fruhst.

Known only from a single female taken by Doherty at Renong Peninsular Siam, (*vide* Seitz. *Macrolep.* 9, p. 392).

## SUB-FAMILY—AMATHUISINÆ.

124. *FAUNIS ARCESILAUS ARCESILAUS* Fabr.

Apparently rare. Four specimens taken in the Me Song forest, Præ, in April 1916. The type specimen of *Clerome arcesilaus*, which was described by Fabricius from Siam in 1770, is preserved in the Bankhan Cabinet in the British Museum.

125. *FAUNIS FAUNULA FAUNALA* Westw.



A few specimens taken on Koh Chang in January and on Khao Sebap, Chantabun, in March.

126. *STICHOPTHALMA GODFREYI* Rothsch.

Described by Lord Rothschild in the *Annals and Magazine of Natural History*, Series 8, Vol. 17., No. 102, June 1916, p. 474. The type specimen was taken near Kanburi in May 1914; a second specimen was obtained at Hup Bon in May 1915 and four others on Khao Sebap, Chantabun, in March 1916.

127. *AMATHUSIA PHIDIPPUS ADUSTATUS* Fruhst.

Widely distributed but nowhere common. This race, which is known only from Siam, was described by its author from specimens taken in Bangkok.

128. *THAUMANTIS DIORES DIORES* Dbl.

Three specimens taken on the Petchaburi River in April, two on Khao Sebap, Chantabun, in March, and two in the Me Song forest, Prae, in April.

129. *THAURIA LATHYI SIAMENSIS* Rothsch.

Described by Lord Rothschild in the *Annals and Magazine of Natural History*, Series 8, Vol. 17, No. 102, June 1916, p. 474. This butterfly is not uncommon at Hup Bon where I obtained the type specimen in April 1914, but I have not met with it elsewhere in Siam.

SUB-FAMILY—DISCOPHORINÆ.

130. *DISCOPHORA TULLIA ZAL* Westw.

I have taken this butterfly only in Bangkok, where it is rare, and in the Me Song forest, Prae, where it was quite common in April 1916.

131. *DISCOPHORA CONTINENTALIS SEMINECHO* Stich.

This butterfly was identified from a badly damaged female obtained by Mr. G. A. Webb at Bang Kwang near Bangkok in November 1913. I have since (April 1916) taken a number of specimens of both sexes in the Me Song forest, Prae.

SUB-FAMILY—NYMPHALINÆ.

132. *ERGOLIS MERIONE PHARIS* Fruhst.

Widely distributed and not uncommon. This race was originally described from Siam, but it also occurs in Tenasserim and South Annam.



133. *ERGOLIS SPECULARIA* ARCA Fruhst.

Occurs in most districts, but is nowhere common.

134. *PENTHEMA DARLISA MIMETICA* Lathy.

Only four examples of this butterfly are known.

It was described, as *PentHEMA mimetica*, from a single female which came from the neighbourhood of Korat, and which is now in the Adams Collection in the British Museum. I have since taken three other females—one at Hup Bon in April 1914, and two at Pak Jong in January 1914. One of these specimens is now in the British Museum.

On the upper side, the female of *mimetica* bears a most extraordinary resemblance to the female of *E. m. mulciber*. The first time I came across it I was completely deceived, and should have left it alone as being *mulciber* had not its flight struck me as peculiar for that butterfly. On the second occasion I was again deceived, although I was prepared for the resemblance. The third specimen was resting on the ground with closed wings and the resemblance was not so obvious.

135. *CUPHA ERYMANTHIS LOTIS* Sulz.

More or less common everywhere.

136. *ATELLA PHALANTHA PHALANTHA* Drury.

A few specimens taken on the Petchaburi River in April, and at Sriracha in September.

137. *ATELLA ALCIPE ALCIPOIDES* Moore.

This butterfly was quite common on the Petchaburi River in April 1910, but I have seldom come across it since.

138. *ISSORIA SINHA SINHA* Kollar.

Widely distributed, but not common.

139. *CYNTHIA EROTA EROTA* Fabr.

Males common in all forest areas, females rare.

140. *CIRROCHROA FASCIATA FASCIATA* Fldr.

Not uncommon in Bangkok, but apparently rare elsewhere.

The dry-season form is *flavobrunnea* Sn.

141. *CIRROCHROA TYCHE MITHILA* Moore.

Widely distributed and fairly common.

142. *CIRROCHROA SURYA SIAMENSIS* Fruhst.

This butterfly is at present known only from Bangkok, where it is rather scarce.



143. *TERINOS CLARISSA FALCATA* Fruhst (= *falcipennis* Lathy).

This butterfly was quite common in April 1910 on the Petchaburi River, where it was often to be found in hundreds in shady jungle paths, but I have seldom come across it since.

144. *TERINOS TERPANDER INTERMEDIA* subsp. nov.

Intermediate in form between *T. terpander* Hew. from Borneo and *T. teos* de N. from Sumatra. On the upperside it closely resembles *terpander*, except that the light orange-coloured margin is much reduced in size; on the underside it approximates more closely to *teos*. Type and only known specimen obtained at Sriracha in September 1912.

145. *CETHOSIA BIBLIS VIRIDIANA* Fruhst.

Widely distributed and not uncommon. This butterfly was obtained by Pavie at Luang-Prabang, so that its occurrence in Siam was to be expected.

146. *CETHOSIA CYANE EUANTHES* Fruhst.

Fairly common everywhere.

147. *CETHOSIA HYPSEA HYPISINA* Felder.

A single male taken at Sriracha in April 1914.

148. *PRECIS IPHITA IPHITA* Linn.

Widely distributed, but not very common.

149. *PRECIS ATLITES* Linn.

Common everywhere all the year round.

150. *PRECIS ALMANA ALMANA* Linn.

Common everywhere all the year round.

151. *PRECIS LEMONIAS ÆNARIA* Fruhst.

Common everywhere all the year round.

152. *PRECIS ORITHYA OCYALE* Hbn.

Widely distributed, but nowhere common.

153. *PRECIS HIERTA* Fabr.

A male taken in Bangkok in January 1910, and two others in the Me Song forest, Præ, in April 1916. There are three specimens in the Bangkok Museum taken by Haase in Bangkok, in 1891.

154. *SYMBRENTHIA HIPPOCLUS DARUCA* Moore.

Three specimens taken in the Me Song forest, Præ, in April 1916.

155. *YOMA SABINA VASUKI* Doh.



Up to 1914 I had taken only one specimen of this butterfly, but in April and May of that year I met with it in great numbers everywhere throughout the Sriracha district—in the jungle, in the padi-fields, in the villages, and even on the sea-shore. In Sriracha itself, the butterflies often entered the bungalows, and around the village they were frequently to be seen clustered on heaps of wood ashes. It is interesting to note that I had collected in the district at various times during the six previous years but had not met with the butterfly there, and that in the same months of the following year I found it very scarce everywhere throughout the district. Fruhstorfer gives *javana* as the Siamese race, but I think this is a mistake. My males are quite different from his figure of *javana*, but agree exactly with that of *vasuki*.

156. *HYPOLIMNAS MISSIPUS* Linn.

Apparently rare. I have only three specimens in my collection—a male taken at Sriracha in September and two females given to me by H. R. H. The Prince of Chumpon, who obtained them in Bangkok in March.

157. *HYPOLIMNAS BOLINA BOLINA* Linn.

Fairly common everywhere all the year round.

158. *DOLESCHALLIA BISALTIDE SIAMENSIS* Fruhst.

Not common. Taken only in the Sriracha district and on the Dong Rek hills. Fruhstorfer restricts this race to Siam.

159. *KALLIMA INACHUS SIAMENSIS* Fruhstorfer.

Occurs in most forest areas, but is nowhere common. Fruhstorfer restricts this race to Siam.

160. *CYRESTIS PERIANDER PERIANDER* Fabr.

Widely distributed and not uncommon.

161. *CYRESTIS COCLES COCLES* Fabr.

Widely distributed and quite common. Vast numbers of this species were seen on the Petchaburi River in April and May 1910 and again, in the same months, in 1912. The butterflies were always found on moist spots lying in shade, and, when disturbed, they rose in clouds. In some places they were clustered so thickly, and were so occupied in sucking up moisture, that it was quite impossible to tread without crushing them. They were present in great numbers at all



the drinking places frequented by butterflies, but were always in shady spots, and always in groups by themselves. They seemed to resent very strongly the intrusion of any other butterfly into their own particular group, and I noticed that the intruder always quickly withdrew. As a rule, the groups consisted of the pale variety only, but on several occasions both pale and dark forms were seen side by side at the same spot. In May 1914, in a waterless section of the forest near Hup Bon I found the butterflies congregated on damp elephant droppings. *C. cocles* was originally described from Siam.

162. *CYRESTIS NIVEA* subsp?

Fruhstorfer (Seitz, Macro-lep. 9, p. 575) records *C. nivea* from Siam, but does not give the race.

163. *CYRESTIS THYODAMAS THYODAMAS* Bsdv.

Generally distributed but nowhere common.

164. *CHERSONESIA RISA TRANSIENS* Mart.

A few specimens of both sexes taken at Hup Bon in April and May 1914.

165. *CHERSONESIA PERAKA AZA* Streck.

Recorded by Fruhstorfer (Seitz, Macro-lep. 9, p. 594) who says that it was described from two specimens from "Lower Siam."

166. *RAHINDA HORDONIA PLAGIOSA* Moore.

Common everywhere all the year round.

167. *RAHINDA PERAKA ASSAMICA* Moore.

Rare. Three males taken at Pak Jong in January.

168. *RAHINDA AURELIA* Stgr.

A single male of this rare Neptid was taken at Hup Bon in May.

169. *NEPTIS HYLAS ACERIDES* Fruhst.

Common everywhere all the year round.

170. *NEPTIS NANDINA GONATINA* Fruhst.

Taken sparingly on the Dong Rök hills in December and January. Fruhstorfer restricts this race to Siam.

171. *NEPTIS SOMA TUSHITA* Fruhst.

Not uncommon in the Sriracha district and on the Dong Rök hills. Fruhstorfer restricts this race to Siam.

172. *NEPTIS HELIODORE HELIODORE* Fabr.

Fruhstorfer says this Neptid "is not scarce in Central Siam, at



an elevation of about 1000 ft. (January.)" I have not yet come across it. *N. heliodora* was originally described from Siam.

173. *NEPTIS VISAKI HARITA* Moore.

A single male taken at Hup Bon in May.

174. *NEPTIS COLUMELLA MARTABANA* Moore.

Taken sparingly on the Dong Rek hills in December and January, and in the Sriracha district in April and May.

175. *NEPTIS MIAH NOLANA* Druce.

Five specimens taken at Pak Jong in January. *Neptis nolana* was described by Druce from Siam in 1874.

176. *NEPTIS FULIGINOSA FULIGINOSA* Moore.

Two males and two females of this very rare Neptid were taken at Pak Jong in January.

177. *PANTAPORIA PRAVARA INDOSINICA* Fruhst.

A single specimen taken at Pak Jong in January.

178. *PANTAPORIA PERIUS* Linn.

Taken very sparingly in the Sriracha district in April, May and September, and on the Dong Rek hills in January.

179. *PANTAPORIA LARYMNA SIAMENSIS* Fruhst.

Generally distributed but nowhere common. Fruhstorfer gives the habitat of this race as "Malay Peninsula to Upper Tenasserim."

180. *PANTAPORIA RANGA OBSOLESCENS* Fruhst.

A few specimens taken at Pak Jong in January and in the Me Song forest, Prae, in April.

181. *PANTAPORIA SELENOPHORA BAHULA* Moore.

Two specimens taken at Hup Bon in September and two others in the Me Song forest, Prae, in April.

182. *PANTAPORIA ZEROCA GALÆSUS* Fruhst.

A single specimen taken in the Me Song forest, Prae, in April 1916. Fruhstorfer restricts this race to Siam, but says that examples from the Karen Hills are probably indetical with it.

183. *PANTAPORIA NEFTE ASITA* Moore.

A single specimen taken in the Me Song forest, Prae, in April.

184. *LIMENITIS PROCRIS PROCRIS* Cr.

This species was exceedingly common on the Petchaburi River in April 1910, but I have not found it plentiful in any other locality



since. The butterflies were at all my camping places on the Petchaburi River, and often congregated in numbers around the cook's quarters. At one camp I took some dozens of specimens on a drying Sambar skin.

185. *PANDITA SINOPE SINOPE* Moore.

A single male taken at Hup Bon in April 1914.

186. *LEBADEA MARTHA MARTHA* Moore.

Widely distributed, but nowhere common.

187. *PARTHENOS SYLVIA APICALIS* Moore.

Widely distributed and not uncommon. As a rule I have found this butterfly very difficult to capture, but I have occasionally taken it quite easily at baits of over-ripe bananas.

188. *EUTHALIA LEPIDEA COGNATA* Moore.

This is a very rare butterfly known only from a few examples from Siam. It was described by Moore, as *Cynitia cognata*, from a single female which is preserved in the British Museum. This was the only specimen known until 1901, when Fruhstorfer obtained the male near the ruins at Ankor in December. I have since taken two males and a female at Sriracha in September 1912, and four males and a female at Hup Bon in April 1914. Four of my specimens are now in the British Museum.

189. *EUTHALIA JULII ODILINA* Fruhst.

Not uncommon in most forest areas. Fruhstorfer restricts this race to Siam.

190. *EUTHALIA COCYTUS COCYTUS*.

Occurs in most forest areas, but is not common. This butterfly which is found only in Siam, was described by Fabricius in 1787.

191. *EUTHALIA FLORA SALANGANA* Fruhst.

There are specimens of this butterfly from Siam in the Adams collection in the British Museum.

192. *EUTHALIA JAHNU JAHNIDES* Fruhst.

Three specimens taken at Hup Bon in April.

193. *EUTHALIA KESAVA DISCIPILOTA* Moore.

A few specimens taken in the Sriracha district in April and May, and on the Dong Rek hills in January and February.

194. *EUTHALIA GARUDA APAMA* Fruhst.



Fairly common everywhere. May be found in fruit gardens in Bangkok all the year round.

195. *EUTHALIA ERIPHYLE CHULA* Fruhst.

Three males taken at Pak Jong in January, one female at Hup Bon in April. Fruhstorfer restricts this race to Siam.

196. *EUTHALIA ANOSIA* subsp.?

A single male which I identify as belonging to this species was taken in the Me Song forest, Prae, in April 1916. It is almost certainly referable to the race *anosia* Moore, whose occurrence in Siam was predicted by Fruhstorfer from the fact that it was obtained by Pavie in the Laos States. Fruhstorfer (1913) divides up the species into six different races, but J. C. Moulton in a recent paper on the Butterflies of Borneo (The Sarawak Museum Journal. Vol. II, Part II, No. 6, September 1915. p. 226.) rejects this division on the grounds that the differences given are insufficient and founded on too few specimens.

197. *EUTHALIA PHEMIUS PHEMIUS* Dbldy.

A male taken at Sriracha in April 1911, and a female in the Me Song forest, Prae, in April 1916.

198. *EUTHALIA LUBENTINA INDICA* Fruhst.

I took six males and four females of this butterfly in my own compound in Bangkok in December 1911, but I have seldom come across it since. There are specimens in the British Museum taken by Druce in Siam in 1874.

199. *EUTHALIA ADONIA BEATA* Fruhst.

Described by Fruhstorfer from a few specimens taken in Bangkok. I have not yet met with it.

200. *EUTHALIA TEUTA TEUTA* Dbldy.

Widely distributed and fairly common. I have found it most difficult to obtain good specimens of this butterfly.

201. *EUTHALIA RECTA MONILIS* Moore.

A few specimens taken in the Sriracha forest in April. Mr. E. W. Trotter obtained three specimens for me on Koh Phai in March.

202. *EUTHALIA EVELINA VALLONA* Moore.

Not common. A few specimens taken in the Sriracha district in April, May and September, and on the Dong Rek hills in January.



203. *EUTHALIA DIRTEA JADEITINA* Fruhst.

I took a male and a female of this butterfly at Sriracha in April 1911, but did not come across it again until April 1916, when I obtained a number of specimens of both sexes in the Me Song forest, Prae.

204. *EUTHALIA CYANIPARDUS ALBOPUNCTATA* Crowl.

Taken by Fruhstorfer at Muak Lek in January (Seitz, *Macro-lep.* 9, p. 693).

205. *APATURA PARISATIS SIAMENSIS* Fruhst.

Occurs in most forest areas and is not uncommon.

This may or may not stand as a good subspecies; the differences on which Fruhstorfer separates it from allied races are extremely slight and, in my opinion, are not constant. Fruhstorfer restricts the race to Siam.

206. *APATURA AMBICA MIRANDA* Fruhst.

A male taken at Sriracha in September, and another in the Me Song forest, Prae, in April.

207. *SEPHISA CHANDRA ANDRODAMAS* Fruhst.

Has been recorded from the Mekong valley, Northern Siam. (Seitz, *Macro-lep.* 9, p. 701.)

208. *HESTINA NAMA* Dbldy.

Recorded from Siam by Bingham (*Faun. Br. Ind., Butterflies*, Vol. I, p. 239.)

209. *CALINAGA BUDDHA SUDASSANA* Melv.

Occurs in Northern Siam. The type was obtained in the Chiengmai district.

210. *HERONA MARATHUS ANGUSTATA* Moore.

A single specimen taken at Pak Jong in January 1914, and several others in the Me Song forest, Prae, in April 1916. It was not uncommon in the Me Song forest, but I found it most difficult to capture.

211. *EURIPUS HALITHERSES HALITHERSES* Dbldy.

According to my observations this butterfly is rare in Siam, but Fruhstorfer apparently found it quite common.

212. *EURIPUS CONSIMILIS* Westw.

Moore (*Lep. Ind., Vol. III*, p. 45) states that a female of this butterfly has been taken near Bangkok.



213. *CHARAXES POLYXENA CORAX* Fldr.

Males not uncommon in all forest areas; females very rare.

214. *CHARAXES FABIUS SULPHUREUS* Rothsch.

A single male taken at Ban Dan in April 1914, and four others in the Me Song forest, Prae, in April 1916.

215. *EULEPIS ATHAMAS* Drury. \*

Widely distributed, but nowhere common.

216. *EULEPIS ARJA* Fldr. \*

A male taken at Sriracha in April, and another in September.

217. *EULEPIS DELPHIS* Dbldy. \*

Two males taken on the Petchaburi River in April 1910, and two others in the Me Song forest, Prae, in April 1916.

218. *EULEPIS NEPENTHES* Grose-Smith.

Recorded from Siam by Bingham (Faun. Br. Ind., Butterflies, Vol. I, p. 226.)

219. *EULEPIS EUDAMIPPUS NIGROBASALIS* Lathy.

Four males taken on the Petchaburi River in April 1910, and two others in the Me Song forest, Prae, in April 1916.

## SUB-FAMILY—LIBYTHEINÆ.

220. *LIBYTHEA MYRRHA* Godart.221. *LIBYTHEA ROHINI* Marshall.222. *LIBYTHEA GEOFFROYI ALOMPRA* Moore.223. *LIBYTHEA HAUXWELLI* Moore.

I found these four species very common in April 1912 at the Siamese Survey camp in the Huey Me Pradone in N. Lat. 13° and, E. Long. 99° 30'. *Myrrha* was an occasional visitor, but the others were present in crowds throughout the day. In the early mornings, the butterflies were to be found resting on rocks and stones near the river-side; later in the day they congregated on moist patches of ground around the camp, and remained there till quite late in the afternoon, being the last of all the butterflies to leave. Spots fouled with urine had a particular attraction for them. They also congregated on clothes drying in the sun. *Rohini* is not uncommon in other parts of Siam, *alomptra* and *myrrha* are scarce. I have not since come across *hauxwelli*. I have followed Bingham in recording *hauxwelli*

\* I am unable at present to refer these three butterflies to their particular races.



as a separate species, but I am quite unaware as to whether it still stands as a good species or is, as he conjectured, merely a variety of *L. g. alompra*.

SUB-FAMILY-NEMEOBIDÆ.

224. *ZEMEROS FLEGYAS* Cr.

A few specimens taken in the Me Song forest, Prae, in April 1916. There are three specimens in the Bangkok Museum taken by Haase at Chantabun in January 1891.

225. *TAXILA THUISTO* EPHORUS Fruhst.

A few specimens taken at Hup Bon in April 1914, and in the Me Song forest, Prae, in April 1916.

226. *TAXILA HAQUINUS* BERTHE Fruhst.

Taken very sparingly at Muak Lek in January, at Hup Bon in April and in the Me Song forest, Prae, in April.

227. *ABISARA NEOPHRON* Hew.

Four specimens taken on Khao Seap, Chantabun, in March 1916. There are three specimens in the Bangkok Museum taken by Haase in the same locality.

228. *ABISARA META SIAMENSIS* Fruhst.

Three specimens taken at Hup Bon in April 1914, and a few others in the Me Song forest, Prae, in April 1916.

229. *STIBOGES NYMPHIDIA* Btlr.

Three specimens taken at Hup Bon in April 1914.

FAMILY—LYCÆNIDÆ.

SUB-FAMILY—GERYDINÆ.

230. *GERYDUS BOISDUVALI* IRRORATUS Druce.

Occurs in most localities, but is by no means common. This butterfly was originally described from Siam.

231. *GERYDUS ANCON SIAMENSIS*, subsp. nov.

A fine new subspecies which differs from the typical form in the reduction of the white areas of the forewing. These areas consist of a triangular patch beyond the cell, a subquadrate one in 2, a narrow oblong one extending from below this towards the base in I. c., and a very small diffuse patch below the submedian in a line with the patch above. Below, a shade paler than in typical specimens.

Type 1♂. Muak Lek, 8. I. 14. in the British Museum.



232. *ALLOTINUS HORSFIELDI CONTINENTALIS* Fruhst.

Taken sparingly in the Sriracha district in April, and on the Dong Rek hills in January.

## SUB-FAMILY—LYCÆNINÆ.

233. *NEOPITHECOPS ZALMORA* Btlr.

Not uncommon at Muak Lek and Pak Jong, but rare elsewhere.

234. *MEGISBA MALAYA* Horsf.

A single male taken at Pak Jong in January 1914, and another in the Me Song forest, Præ, in April 1916.

235. *CYANIRIS PUSPA IMPERATRIX* Btlr.

Widely distributed and fairly common, especially on the Dong Rek hills.

236. *CYANIRIS ALBADISCA* Moore.

Three specimens taken at Pak Jong. Also taken by Fruhstorfer at Hinlap.

237. *CYANIRIS TRANSPECTA* Moore.

Three males and seven females taken at Pak Jong in January 1914.

238. *CHILADES LAIUS* Cr.

Widely distributed and not uncommon.

239. *ZIZERA OTIS* Fabr.

Common everywhere all the year round.

240. *ZIZERA GAIKA* Trimen.

Occurs with *Z. otis*, but is not nearly so common.

241. *EVERES RILEYI*, sp. nov.

♂ *Upperside*: greyish blue, forewing with the hind margin rather narrowly dark grey; hindwing costal margin broadly dark grey, inner margin pale grey, hind margin narrowly dark grey with darker spots in areas 2 and 3, these being distally white-edged and having proximally a faint trace of orange. Fringes very narrowly white, distally grey. *Underside*: pale grey, forewing with a darker oblong spot at end of cell, near the margin a row of five similar though shorter spots, a trace, of a sixth set inwardly at the apical end, all white-edged. Beyond an ill-defined dark grey line running from apex to hind margin, and between this and the thin black margin a similar line, narrower and interrupted at the nervures. Both lines curve inwardly considerably



at the apex. Hindwing similarly marked, the ground colour distally somewhat paler. The space between the two antemarginal lines in interspaces 2 and 3 and part of 4, orange, with two large black metallic spots bearing a few metallic scales in 2 and 3. A discal row of six grey spots commencing in 1 c rather near the margin, the second spot set inwardly in 2 followed by three running directly towards the apex, the sixth spot again set decidedly inwards. Four white-edged black spots: one each distally in 1 b and 7, one centrally in the cell and the fourth also in area 7 basally some way before the middle.

♀ *Upperside*: uniformly dark grey-brown without any trace of blue. Hindwing with darker marginal spots in areas 2 and 3 proximally surmounted by orange lunules distally white-edged; indications of similar spots in 4 and 1 c. Fringes darker than in ♂. *Underside* exactly like that of the ♂ except that the orange-coloured area is very slightly larger, extending into 1 c, the enclosed black spots being also slightly larger.

Types 1 ♂, 1 ♀, Bangkok, Feb. 1912, in the British Museum.

A second ♂ in the British Museum from Hinlap (H. Fruhstorfer)\* differs in being brighter, the dark margin broader, and the orange lunules on the hind wing fully developed. The underside has a decided, though very slight, brownish tinge. The upperside of both ♂ and ♀ of this species bears a considerable resemblance to that of *E. dipora* Moore; it is readily distinguished from that species, however, by the underside which agrees very closely with that of *E. parhasius* Fabr. In the latter species, however, the spot in the cell and the distal one in area 7 are equidistant from the proximal one in area 7, whereas in *E. rileyi* the distal spot in area 7 is much further away. Apart from this, the ♂ of *E. parhasius* is much paler and the female has a considerable amount of blue on the upper surface.

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\* In 1913 I wrote to Herr Fruhstorfer saying that I had examples of an *Everes* which agreed fairly well with a single specimen of his in the British Museum from Hinlap, labelled *E. parhasius* Fabr., but that I thought the butterfly belonged to a separate species. He replied saying that I was correct and should describe the species. Mr. Riley confirmed his opinion.



I have taken a number of specimens of this butterfly on the west bank of the river in Bangkok, mostly in December, January and February, but have seldom come across it elsewhere.

I have named the species after Mr. N. D. Riley who has helped me very much in working out the butterflies of the country.

242. *CATOCHRYSOPS STRABO* Fabr.

Common everywhere all the year round.

243. *CATOCHRYSOPS PANDAVA* Horsf.

Also common.

244. *CATOCHRYSOPS CNEJUS* Fabr.

Widely distributed, but not very common.

245. *TARUCUS PLINIUS* Fabr.

This butterfly was not uncommon in the Me Song forest Prae, in April, 1916, but I have seldom come across it elsewhere.

246. *CASTALIUS ROSIMON* Fabr.

Common everywhere all the year round.

247. *CASTALIUS ELNA* Hew.

Occurs in most localities, but is not common.

248. *CASTALIUS ETHION* Dbldy and Hew.

A few specimens taken in the Sriracha forest in April and May.

249. *NIPHANDA CYMBIA MARCIA* Fawcett.

Three males taken in the Me Song forest, Prae in April 1916.

250. *LYCÆNESTHES EMOLUS* Godart.

Quite common in Bangkok, but not very plentiful in other parts of the country.

251. *LYCÆNESTHES LYCÆNINA* Fldr.

Two specimens taken on the west bank of the river in Bangkok in February.

252. *NACADUBA BHUTEA* de N.

Widely distributed, but nowhere common.

253. *LAMPIDES BOCHUS* Cr.

This butterfly was quite common in the Me Song forest, Prae, in April 1916, but I have seldom met with it elsewhere in Siam.

254. *LAMPIDES CELENO* Cr.

This with its dry-season form *conferenda* Btlr. is common everywhere.



255. *POLYOMMATUS BOETICUS* Linn.

I took a number of specimens of this butterfly on the west bank of the river in Bangkok in January, 1912, but have not come across it since.

## SUB-FAMILY—PORITINÆ.

256. *PORITIA PHARYGE* Hew.

Two damaged specimens taken in the Me Song forest, Præ, in April 1916. Also taken by Doherty at Renong in Peninsular Siam.

257. *ZARONA ZANELLA* de N.

Taken by Bingham on the frontier between Siam and Tenasserim (Faun. Br. Ind., Butterflies, Vol. II, p. 471.)

## SUB-FAMILY—CURETINÆ.

258. *CURETIS THETIS GLORIOSA* Moore.

Widely distributed, but everywhere scarce.

259. *CURETIS BULIS MALAYICA* Fldr.

A single specimen taken at Sriracha in April 1914, and several others in the Me Song forest, Præ, in April 1916. There are two specimens in the Bangkok Museum taken by Haase at Bangpailin in December 1891.

## SUB-FAMILY—THECLINÆ.

260. ? *APHNÆUS VULCANUS* Fabr.

Six specimens which I doubtfully identify as belonging to this species were taken at Sriracha in April 1914.

261. *APHNÆUS SYAMA PEGUANA* Moore.

I have taken a number of specimens of this butterfly in Bangkok, mostly in December, January and February, but have seldom met with it elsewhere.

262. *APHNÆUS LOHITA* Horsf.

I took one specimen of this butterfly at Pak Jong in January 1914, and have since obtained three others in Bangkok.

## SUB-FAMILY—ARHOPALINÆ.

263. *THADUKA MULTICAUDATA* Moore.

This butterfly was quite common in the Me Song forest, Præ, in April 1916, but I have not met with it elsewhere.

I identify the butterfly from Bingham's figure of the male



(Faun. Br. Ind., Butterflies, Vol. II, Plate XX.), with which my specimens agree very closely.

264. *MAHATHALA AMERIA* Hew.

Four specimens taken at Nong Khai Ploi in April 1914.

265. *AMBYLPODIA ANITA* Hew.

Two males taken at Pak Jong in January, and a female at Sriracha in April. This butterfly was originally described from Siam.

266. *SURENDRA QUERCETORUM* Moore.

A male and two females taken at Pak Jong in January, and two females in the Me Song forest, Præ, in April.

267. *SURENDRA* sp.?

A single specimen [No. 204] which was taken at Nong Khai Ploi in April 1914, and which is now in the British Museum, has not yet been identified. It is near to *S. vivarana* Horsf.

268. *ARHOPALA CENTAURUS* Fabr.

This butterfly is very plentiful in Bangkok, especially in December, January and February, but I have not found it by any means common in other parts of the country.

269. *ARHOPALA ALITÆUS MIRABELLA* Doh.

Four specimens taken at Nong Yai Boo in April 1914.

270. *ARHOPALA AIDA* de N.

Two specimens taken at Nong Yai Boo in April 1914.

271. *ARHOPALA ANARTE* Hew.

Five males and one female of this rare butterfly were taken at Nong Khai Ploi in April 1914. The female and two of the males are now in the British Museum. The female is only the second example they have as yet received.

272. *ARHOPALA RAFFLESII* de N.

There are two specimens of this butterfly in the Bangkok Museum taken by Haase at Chantabun in March 1892.

273. *ARHOPALA EPIMUTA* Moore.

Four specimens taken at Hup Bon in April 1914.

274. *ARHOPALA ANTIMUTA* Fldr.

A single specimen taken at Hup Bon in April 1914.

275. *ARHOPALA EUMOLPHUS* Cr.

Two specimens taken at Hup Bon in March 1914, and two



others in the Me Song forest, Prae, in April 1916.

276. *ARHOPALA ABSEUS* Hew.

Two specimens taken at Hup Bon in April 1914.

277. *ARHOPALA DIARDI* Hew.

Four specimens taken at Hup Bon in April 1914.

278. *ARHOPALA APIDANUS* Cr.

Two specimens taken at Sriracha in September 1914.

279. *ARHOPALA ATRAX* Hew.

Six specimens taken at Hup Bon in April 1914.

280. *ARHOPALA ALEA* Hew.

Four specimens taken at Hup Bon in April 1914.

281. *ARHOPALA PERIMUTA* Moore.

Four specimens taken at Hup Bon in April 1914.

SUB-FAMILY—*DEUDORIGINÆ*.

282. *RAPALA SPHINX* Fabr.

Four females taken at Hup Bon in April 1914.

283. *RAPALA SCHISTACEA* Moore.

One specimen taken at Sriracha in April, three at Pak Jong in January and six in the Me Song forest, Prae, in April.

284. *RAPALA PETOSIRIS* Hew.

Widely distributed and quite common.

285. *RAPALA JARBAS* Fabr.

A few specimens of both sexes taken in the Sriracha district and in the Me Song forest, Prae, in April.

286. *RAPALA XENOPHON* Fabr (= *diences* Hew.)

Four males taken at Hup Bon in April 1914.

287. *RAPALA SUFFUSA* Moore.

Three males and a female taken at Hup Bon in April, one male at Pak Jong in January, and two males in the Me Song forest, Prae, in April.

288. *DACALANA VIDURA* Holsf.

One male taken at Hup Bon in April 1914, and one in the Me Song forest, Prae, in April 1916.

289. *CAMENA COTYS* Hew.

A single female taken at Hup Bon in April 1914.

290. *TAJURIA LONGINUS* Fabr.



A male taken in Bangkok in February 1913, and a female in June 1915.

291. *HYPOLYCÆNA ERYLUS* Godart.

Widely distributed and fairly common.

292. *ARAOTHES LAPITHIS* Moore.

Two specimens taken at Sriracha in April 1914.

293. *BIDUANDA MELISA* Hew.

Two males taken at Nong Khai Ploi in April 1914.

294. *MARMESSUS LYSIAS* Fabr.

I have found this butterfly quite common in the Sriracha and Me Song forests, but have not met with it elsewhere in Siam.

295. *CHERITRA FREJA* Fabr.

Fairly common in all forest areas.

296. *ZELTUS ETOLUS* Fabr.

Taken sparingly on the Dong Rek hills in January, and in the Me Song forest, Prae, in April.

297. *BINDAHARA PHOCIDES ARECA* Fldr.

Four specimens taken at Hup Bon in April 1914.

298. *LOXURA ATYMNUS* Cr.

Widely distributed but nowhere common.

299. *YASODA TRIPUNCTATA* Hew.

There is a single specimen of this butterfly in the Bangkok Museum taken by Haase at Chantabun.

300. *NEOMYRINA HIEMALIS* Godm. and Salv.

A single male taken at Sriracha in March. Has also been recorded from Renong and Kanburi.

301. *DRINA DONINA* Hew.

Six specimens taken at Hup Bon in April 1914, and four others in the Me Song forest, Prae, in April 1916.

302. *CATAEPÆCILMA ELEGANS* Druce.

Two specimens taken in the Me Song forest, Prae, in April 1916.

#### FAMILY—*HESPERIIDÆ*.

##### SUB-FAMILY—*HESPERIINÆ*.

303. *ORTHOPHÆTUS LALITA* Doh.

A male and a female taken at Hup Bon in April 1914,

304. *CAPILA ZENNARA* Moore.



Six badly battered specimens taken at Hup Bon in April 1914. I experienced much difficulty in obtaining this skipper. I came across it in a narrow path in very dense jungle, where it was most difficult to use a net. It was flying up and down the path with great speed, occasionally resting for a second or two on the underside of a leaf.

305. *CHARMION FICULNEA* Hew.

Has been recorded from Siam (Lep. Ind., Vol. X, p. 28.)

306. *CELÆNORRHINUS ASMARA ADITTA* Fruhst.

A few specimens taken at Pak Jong and Muak Lek in January, and in the Me Song forest, Prae, in April.

307. *CELÆNORRHINUS AURIVITTATA* Moore.

A few specimens taken at Hup Bon, and in the Me Song forest, Prae, in April.

308. *CELÆNORRHINUS LEUCOCERA* Koll.

This skipper was not uncommon in the Me Song forest, Prae, in April 1916, but I have seldom come across it elsewhere in Siam.

309. *COLADENIA DAN* Fabr.

Widely distributed and fairly common. Apparently a very variable species.

310. *COLADENIA INDRANI* Moore.

A single specimen taken at Sriracha in April 1914, and two others in the Me Song forest, Prae, in April 1916.

311. *ODONTOPTILUM ANGULATA* Fldr.

A single specimen taken at Sriracha in September, and one other in the Me Song forest, Prae, in April.

312. *TAPENA THWAITESI* Moore.

Seven specimens taken near Sriracha in April. Found with other butterflies at a pool in a shady jungle path.

313. *CAPRONA SYRICTHUS* Fldr.

A few specimens taken at Sriracha in April and May, and again in September.

314. *TAGIADES ATTICUS* Fabr.

I have taken a number of specimens of this butterfly on the Dong Rek hills, mostly in December and January, but have seldom come across it elsewhere.



## 315. TAGIADES MEETANA Moore.\*

A few specimens taken on the Dong Rek hills in January, and in the Sriracha district in April.

## 316. TAGIADES KHASIANA EPICHARMUS Fruhst.\*

Occurs in most forest areas, but is nowhere common.

## 317. TAGIADES PRALAYA Hew.

Three specimens taken at Hup Bon in April 1914, and two others in the Me Song forest, Prae, in April 1916.

## 318. TAGIADES PATINOKA Fruhst.

Taken by Fruhstorfer at Muak Lek in February (*vide* Lep. Ind., Vol. X., p. 55).

## 319. DAIMIO MILLIANA Swinh.

A single specimen taken at Muak Lek in January 1914, and six others in the Me Song forest, Prae, in April 1916.

## 320. SARANGESÀ DASAHARA Moore.

Two specimens taken at Muak Lek in July, and two others at Hup Bon in April.

## 321. HESPERIA GALBA Fabr.

A single specimen taken at Muak Lek in January 1914.

## SUB-FAMILY—PAMPHILINÆ.

## 322. ASTICTOPERUS OLIVASCENS Moore.

Widely distributed and not uncommon.

## 323. SUADA SWERGA de N.

A single specimen taken at Hup Bon in April in 1914, and several others in the Me Song forest, Prae, in April 1916.

## 324. SUASTUS GREMIUS Fabr.

A few specimens taken in Bangkok in January.

## 325. SUASTUS ADITUS Moore.

Taken sparingly on the Dong Rek hills in January, and at Sriracha in September.

## 326. TARACTROCERA SAMADHA Fruhst.

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\* I have recorded these two butterflies under the names by which they were originally identified at the British Museum. Evans in his list of Indian Butterflies (Jour. Bomb. N. H. S., Vol. XXI, p. 999) sinks *meetana* Moore as a synonym of *alica* Moore, and treats *hasiana* as a seasonal form of *T. helferi rari* Moore.



Two specimens taken in Bangkok in February.

327. *TARACTROCERA QUINTA* Swinh.

A single specimen taken in Bangkok in February, and one at Hup Bon in April.

328. *TARACTROCERA LINEATA* Druce.

Described by Druce from Siam (Proc. Zool. Soc., 1874, p. 109).

329. *AMPITTIA MARO* Fabr.

A few specimens taken in Bangkok in January and February.

330. *IAMBRIX SALSALA* Moore.

Widely distributed and fairly common.

331. *ISMA PROTOCLEA* H-Sch.

A single specimen taken at Hup Bon in April 1914.

332. *HYAROTIS ADRASTATUS* Cr.

One specimen taken at Muak Lek in January, two in Bangkok in February, and one in the Me Song forest, Prae, in April.

333. *ZOGRAPHETUS SATWA* de N.

A few specimens taken at Muak Lek and Pak Jong in January, and at Hup Bon in April.

334. *ZOGRAPHETUS OGYGIA* Hew.

A single specimen taken at Muak Lek in January 1914.

335. *ACERBAS ANTHEA* Hew.

Three specimens taken at Hup Bon in April 1914.

336. *ERINOTA THRAX* Linn.

Widely distributed and not uncommon.

337. *ERINOTA ACROLEUCA* W-M and de N. \*

A few specimens taken in Bangkok in January and February.

338. *ERINOTA BATARA* Moore.

Four badly damaged specimens taken at Hup Bon in April 1914.

339. *GANGARA THYRSIS* Moore.

Quite common in Bangkok, but not very plentiful elsewhere.

340. *MATAPA ARIA* Moore.

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\* Col. Swinhoe who saw my collection of skippers at the British Museum in 1913 said this was a separate species, but Evans in his list of Indian Butterflies (Jour. Bomb. N. H. S., Vol. XXI, p. 1003) treats it as a small variety of *E. thrax*.



A few specimens taken in Bangkok in January and February, and at Sriracha in April.

341. *MATAPA SHALGRAMA* de N.

A single specimen taken at Hup Bon in April 1914.

342. *KERANA DIOCLES EVAIRA* Fruhst.

Widely distributed, but nowhere common.

343. *PIRDANA HYELA RUDOLPHII* Elw. and de N.

A few specimens taken at Hup Bon in April 1914.

344. *PLASTINGIA NAGA* de N.

Five specimens taken at Hup Bon in April 1914.

345. *PLASTINGIA LATOIA* Hew.

Two specimens taken at Hup Bon in April 1914.

346. *PLASTINGIA SUBMACULATA* Staud.

Two specimens taken at Hup Bon in April 1914.

347. *HIDARI IRAVA* Moore.

Twelve specimens taken at Hup Bon in April 1914.

348. *NOTOCRYPTA FEISTHAMELII* Bsdv.

Widely distributed and not uncommon.

349. *UDASPES FOLUS* Cr.

I have taken a number of specimens of this butterfly on the west bank of the river in Bangkok, mostly in December, January and February, but have seldom come across it elsewhere.

350. *CUPITHA PURREA* Moore.

Not uncommon on the Dong Rek hills, but apparently rare elsewhere.

351. *TELICOTA AUGIAS* Linn.

Two males taken in Bangkok in November 1912.

352. *TELICOTA BAMBUSÆ* Moore.

A single male taken in Bangkok in February 1913.

353. *TELICOTA GOLA* Moore.

Two specimens taken at Muak Lek in January, and one at Hup Bon in April.

354. *TELICOTA DARA* Koll.

Widely distributed and quite common.

355. *HALPE MOOREI BETURINA* Fruhst.



A few specimens taken at Muak Lek in January, and at Hup Bon in April.

356. *HALPE HOMOLEA* Hew.

A single specimen taken at Hup Bon in April 1914.

357. *PARNARA OCEIA* Hew.

I have taken a number of specimens of this butterfly at Pak Jong and Muak Lek in December and January, but have seldom met with it elsewhere.

358. *PARNARA BRUNNEA* Snell.

A single specimen taken at Hup Bon in April 1914.

359. *PARNARA MATHIAS* Fabr.

Widely distributed and not uncommon.

360. *PARNARA AUSTENI* Moore.

Two males taken in Bangkok in November, one female at Pak Jong in January.

361. *PARNARA ELTOLA* Hew.

Two specimens taken at Hup Bon in April 1914.

362. *PARNARA BADA* Moore.

Two specimens taken in Bangkok in November, and three others at Pak Jong in January.

363. *ISMENE JAINA MORGANA* Fruhst.

364. *ISMENE HARISA* Moore.

This species and the preceding were very common at Pak Jong in January 1914, but I have seldom come across either in other parts of the country. At Pak Jong they were to be found in great numbers on a tall flowering plant which is very common there. They appeared at about five o'clock in the afternoon, and remained till it was quite dark.

365. *BADAMIA EXCLAMATIONIS* Fabr.

Widely distributed and not uncommon.

366. *BIBASIS SENA* Moore.

Widely distributed and not uncommon. Mr. K. G. Gairdner has sent me a very interesting note on this skipper. He writes:—"The smaller of the two skippers sent, is one which has the peculiar habit of exuding drops of water to moisten surfaces on which it desires to feed. This specimen exuded five drops of water within the space of two minutes on the back of my hand, dabbling its trunk in the drop



between its hind legs until finished, when it moved an inch and repeated the process. The drops were of large size and the five together would apparently equal the bulk of the insect's body. I have observed the skipper doing the same thing on a chair or table in camp both this year (1914) and in 1913 and 1912, and the amazing thing is how it can store so much liquid, and how it can exude the drops at will." Mr. Gairdner tells me that he has observed this peculiar habit also in the case of other skippers.

367. *HASORA CHUZA* Hew.

Six specimens taken at Hup Bon in April 1916.

368. *HASORA CHROMUS* Cr.

Occurs in most forest areas, but is not common.

369. *HASORA* sp?

Two specimens taken at Hup Bon in April 1914, one of which [ No. 77 ] was sent to the British Museum, have not yet been identified. They are nearest to *H. chromus*.

370. *HASORA BADRA* Moore.

A single female taken on the west bank of the river in Bangkok in January 1913.

371. *PARATA MALAYANA* Watson.

Has been recorded from Siam (*vide* Lep. Ind., Vol. IX., p. 253).



ON A COLLECTION OF REPTILES AND BATRACHIANS FROM  
PENINSULAR SIAM.

BY MALCOLM. A. SMITH, M. R. C. S., L. R. C. P.

The following species of Reptiles and Batrachians from Peninsular Siam, have been obtained mainly in three separate localities :— (1) in the state of Patiyu, about 60 kilometres north of the Isthmus of Kra ; (2) in the hills of Nakon Sitamarat ; and, (3) in Patani, near the sea coast.

For the majority of the snakes from the last named locality, I have to thank Mr. C. J. Aagaard, who, from time to time during the past three years, has sent me for examination all the specimens which he has collected upon the rubber estate at Bangnara, where he resides.

The collection as a whole is of interest, not only for the addition which it makes to our knowledge of the herpetology of the northern part of the Peninsula, but also because it has been made, for the most part, in that region where the true Siamese fauna meets with that of the Malay Peninsula.

It was unfortunate that no collecting could be done at high elevations in the mountains of Nakon Sitamarat, but our men were handicapped for want of transport and were only able to ascend one of the lower hills. In spite of this, the results obtained there were of considerable interest, and of sufficient promise to justify further exploration of that range.

The following 12 species are not included in Mr. Boulenger's volume upon the Reptiles and Batrachians of the Malay Peninsula. Three of them, however, (marked with an \*), are from just north of the Isthmus of Kra.

LIZARDS :—*Gymnodactylus oldhami*, *Lygosoma tersum*, *L. herberti*, *L. melanostictum*, *L. anguinoides*.\*

SNAKES :—*Tropidonotus nigrocinctus*,\* *Amblycephalus carinatus*.

BATRACHIANS :—*Rana humeralis*, *R. alticola*, *R. limborgi*, *Microhyla pulchra*,\* *Bufo macrotis*.

The tadpole of *Rana limnocharis*, for reasons which are given, is redescribed.



A full synonymy of most of the species mentioned in this article, has already been given in Mr. Boulenger's volume, and there is no need to repeat them all here. I have only quoted an author, when the species is not included in that work, or when the reference bears directly upon some point which is discussed under that species.

The following localities are referred to :—

MAPRIT and KLONG BANG LAI. Maprit, a new station on the Southern Railway, about 15 kilometres inland from, and due West of, Patiyu. Klong-Bang Lai, a camp made on the banks of a stream of that name, about 12 kilometres to the North-west of Maprit, and close to the hills.

KHAO WANG HIP and KLONG WANG HIP. The former, a hill, 800—900 metres high, about 10 kilometres to the North-east of Tung Sawng, in Nakon Sitamarat. From the "lower camp," the lower slopes of the hill were worked, from the "upper camp," the summit and higher portions of the hill. Klong Wang Hip, a slow-running stream near the base of the hill.

BANGNARA and TANGJONG MAS. In Patani, near the sea coast.

In conclusion I should like to express my most sincere thanks to Mr. G. A. Boulenger of the British Museum of Natural History, for his invaluable help in connection with many difficult points of identification.

## REPTILES.

### CHELONIA.

#### 1. TESTUDO EMYS Schleg. & Müll.

A single specimen of this large tortoise was obtained on Khao Wang Hip, Nakon Sitamarat.

#### 2. GEOEMYDA GRANDIS Gray.

Maprit, Patiyu, and Bangnara, Patani.

In the specimen from Maprit, a half-grown female, the plastron is entirely yellow, no dark rays being present at all.

Five young specimens were sent me from Bangnara in June. The smallest had a length of shell of 80 mm. only, and was probably not long out of the egg.

#### 3. GEOEMYDA SPINOSA (Gray).



1 adult from the top of Khao Wang Hip, Nakorn Sitamarat. Total length of shell, mm. It was found at a considerable distance from any water.

4. *CYCLEMYS AMBOINENSIS* (Daudin).

Bangnara, Patani.

5. *BELLIA CRASSICOLLIS* (Gray).

Bangnara, Patani.

*LACERTILIA.*

*GECKONIDÆ.*

6. *GYMNODACTYLUS PULCHELLUS* (Gray).

Khao Wang Hip (upper camp), Nakon Sitamarat, 5 specimens.

Largest, snout to vent, 110 mm., tail 130. The yellow border to the dark bars across the back, is in the half-grown specimens complete, but in the two adults, this colour has entirely disappeared, except upon the enlarged tubercles that are situated along the edge of the bars.

7. *GYMNODACTYLUS PEGUENSIS* Bouleng.

Annandale, Rec. Ind. Museum, IX, p. 323 (1913).

Khao Wang Hip (upper camp), Nakon Sitamarat, 3 adults, 1 young.

The largest is considerably bigger than any previously recorded being 80 mm. from snout to vent. The tail is unfortunately broken off. No lateral fold can be seen in any of the specimens, and allowing for the position in which it would be, there appear to be only about 36 ventral scales across the middle of the belly.

Colour (in spirits). Above, light brown, with dark brown, black-edged markings. In the largest specimen, the spots are confluent across the hinder part of the back, and in all of them, the U-shaped mark across the nape is broken up, either by a division at each side of the head, so as to form three spots, or in the middle, to form two.

8. *GYMNODACTYLUS OLDHAMI* Theobald.

Bouleng, Fauna Brit. Ind., p. 67; Annandale, Journ. As. Soc. Bengal (n.s.) I, p. 83 (1905); idem. Records Ind. Museum, p. 320, pl. XVII, fig. 2 (1913).



Maprit and Klong Bang Lai, P. Siam. 3 specimens.

As already pointed out by Annandale (1905), there is no real evidence that this lizard occurs in Southern India as given in the Fauna. The locality of the type specimen is unknown, but it has since been discovered in the Tavoy district, Tenasserim.

There are no praeanal pores in the only male (a half-grown one) in my possession. One scale bears a slight impression, but it is not perforated. The question as to what is the correct number of pores in this species has already been discussed by Annandale (1913), but it would appear from my specimen, as well as from his own remark upon the type, that this character is not a constant one. A similar peculiarity may occur in *Gonatodes kendalli*, under which heading this point is again referred to.

#### 9. *GYMNODACTYLUS MARMORATUS* (Fitz.).

Bangnara, Patani, 2 specimens.

The species has not been met with north of this locality.

#### 10. *GONATODES KENDALLI* (Gray).

Khao Wang Hip (upper camp), Nakon Sitamarat, 2♂, 2♀  
Maprit and Klong Bang Lai, Patiyu, 6♂, 4♀.

Previously known only from as far north as Perak, the range of this gecko is now considerably extended, as in addition to those obtained from the above mentioned localities, I have since found it at Chantabun, and on Khao Sebab, a hill close by, in South-eastern Siam.

*Gonatodes kendalli* is described as having no praeanal or femoral pores, and the presence of these (6-8 praeanal pores in an obtuse-angled series, interrupted mesially) in the males from some localities, and the absence of them in those from others, was extremely puzzling. In the two specimens from Nakon Sitamarat, they were present, but in the six from Maprit and Klong Bang Lai they were absent, whilst in two other males, one from Chantabun and another from Khao Sebab, they were again present. A larger series is required, however, before one could definitely say whether the character was constant in each locality, and so ascribe it to local conditions, or whether it was dependent upon some other factor. In all other respects the specimens entirely agreed with each other. Mr. Boulenger tells me that since he wrote his description of *G. kendalli*, he has also seen a specimen



from Penrissen Mt., Borneo, with an angular series of preanal pores.

None of my specimens, either from the Peninsula, or from S. E Siam, are mature, the largest one measuring only 40 mm. from snout to vent.

11. *HEMIDACTYLUS PLATURUS* (Schneid.).

Maprit and Klong Bang Lai, Patiyu.

12. *MIMETOZOOM CRASPEDOTUS* (Mocquard).

Rob. and Kloss. Journ. Fed. Malay St. Mus., V, p. 153.

A single specimen of this rare gecko was obtained at Bangnara, Patani. Robinson and Kloss appear to have found it fairly abundant upon Koh Samui, but the only other record of its occurrence in the Peninsula is the single specimen obtained by Flower at Penang.

13. *GEHYRA MUTILATA* (Wiegman).

Bangnara, Patani.

14. *GECKO VERTICILLATUS* Laur.

Klong Wang Hip, Nakon Sitamarat.

15. *GECKO MONARCHUS* (Dum. & Bib.).

Bangnara, Patani. 1 young specimen.

Has not been met with elsewhere in Siam. Further north it is replaced by *G. verticillatus*.

AGAMIDÆ.

16. *DRACO VOLANS* Linn.

Tanjong Mas and Bangnara, Patani, many specimens; Nakon Sitamarat, 2 specimens.

17. *DRACO MACULATUS* (Gray).

Klong Wang Hip, Nakon Sitamarat; 1 specimen.

*D. maculatus* is to Siam, what *D. volans* is to the Malay Peninsula, the common flying lizard of the country. *D. volans* has not been met with north of Nakon Sitamarat, and although *D. maculatus* is recorded from as far south as Singapore, it appears to be extremely rare in the Peninsula.

18. *DRACO FIMBRIATUS* Kuhl.

Bangnara, Patani, 9 ♂, 3 ♀; Cheup Valley, Tanjong Mas, Patani, 1 ♀; Khao Wang Hip (lower camp), Nakon Sitamarat, 1 ♀.

The species is said to be rare in the Peninsula, but from the



number of specimens obtained at Bangnara, it was apparently not uncommon there. The caudal crest is well marked in most of the males, but in all the females it is absent. Nearly all the specimens have some scattered patches of enlarged scales upon the dorsal surface of the body, the most constant one being a large patch at the base of the tail. In the individual from Nakon Sitamarat, these patches were extremely numerous, and occupied nearly half the dorsal surface of the body.

Dimensions of the largest, a ♂ from Bangnara; head and body, 110 mm., tail 175.

Colouration of the Bangnara specimens (in spirits); light grey above, with small scattered spots of intense black; some with faint but regular wavy transverse markings.

#### 19. DRACO PUNCTATUS Bouleng.

A single ♂ specimen of this little known Draco was obtained at Bangnara, Patani. It agrees entirely with the description. The specimen was obtained almost at sea level, at the foot of some low hills to the west of Bangnara. The other two specimens obtained in the Peninsula, were both found at a considerable altitude.

#### 20. DRACO BLANFORDI Bouleng.

Khao Wang Hip (upper and lower camps), Nakon Sitamarat, 5 ♂, 1 ♀.

The specimens obtained upon this hill were unusually fine. The largest, a ♂, measured 140 mm. from snout to vent, with a tail of 245 mm. The single ♀ was considerably smaller; snout to vent 115, tail 190.

#### 21. DRACO FORMOSUS Bouleng.

Tanjong Mas and Bangnara, Patani, 10 ♂, 1 ♀; Khao Wang Hip, Nakon Sitamarat, 1 ♂, 4 ♀; Maprit, Patiyu, 14 ♂, 2 ♀.

On Khao Wang Hip they were obtained at all elevations. In all the specimens from that locality the black bars upon the parachute are much more distinct than in those obtained from the other three localities.

It is stated in the description of this species that the throat of the female is dark green. I have not had the opportunity of examining any of my specimens during life, but have been able to see them, in most cases, soon after their immersion in spirit, and whilst the



colours were still quite fresh. In all of the females the throat was maroon or crimson, as in the male, a little paler perhaps, but not much, and certainly never green. The gular pouch in the female is represented by a short tag.

## 22. DRACO MELANOPOGON Bouleng.

Khao Wang Hip, Nakon Sitamarat, 7 ♂, 2 ♀.

Largest, a ♂, head and body 80 mm., tail 170. The neck, shoulders, and upper surface of the limbs of all these specimens have a handsome slate-blue lustre. The species is not known north of this latitude.

## 23. DRACO QUINQUEFASCIATUS Gray.

Tanjong Mas and Bangnara, Patani. 5♂, 2♀.

It is noticeable in the series of Dracos just named, that the number of males obtained is considerably in excess of the females. Whether this is due to the more active habits of the former, whereby it comes more frequently under notice, or to the actual preponderance of one sex over another, it would be of interest to find out.

## 24. ACANTHOSAURA ARMATA (Gray).

Smith, Journ. Nat. Hist. Soc. Siam, II, p. 53.

Bangnara, Patani; Khao Wang Hip (upper and lower camps), Nakon Sitamarat; Maprit and Klong Bang Lai, Patiyu.

Numbers of this common and very variable jungle-loving lizard were obtained from the localities above mentioned. On Khao Wang Hip it was evidently quite common, as no less than 19 specimens were obtained there, and the variations in the length of the post-orbital and nuchal spines in this large series have already been recorded (*antea* p. 53). With these before one, all of which were from the same locality, it was evident that *A. crucigera*, which had been separated from *armata* by Mr. Boulenger on account of the length of these spines, was not a separate species, but merely an individual variation of the latter. I have referred this point to Mr. Boulenger, and he quite agrees with the decision.

In colouration these specimens were also extremely variable. Grey, brown, sometimes almost black, with dark marblings and patches on the back and sides, the most constantly present of these being a large diamond-shaped one across the back between



the shoulders, and a triangular patch on either side of the head, enclosing the eye. Upper surface of the head in most of them, light greenish-yellow, with, or without dark cross-bars. Usually some light green or grey patches on the flanks. Some with a strong tinge of red upon the back. Belly in some, spotted with black. Tail alternately barred with light and dark.

The nuchal crest in one, is continuous with the dorsal. Some of the specimens, both from Nakon Sitamarat and from Patiyu, have a slight but distinct gular sac.

### 25. *CALOTES CRISTATELLUS* (Kuhl).

Bangnara, Patani, and Klong Bang Lai, Patiyu, 3 specimens.

I have obtained this lizard along the Western boundary of Siam as far north as Lat.  $14^{\circ} 50'$ , but it is evidently rare in the northern part of the Peninsula.

### 26. *CALOTES VERSICOLOR* (Daud.).

Bangnara, Patani, and Klong Wang Hip, Nakon Sitamarat.

### 27. *CALOTES EMMA* Gray.

Patani and Nakon Sitamarat.

### 28. *LIOLEPIS BELLIANA* (Gray).

Bangnara, Patani.

## VARANIDE.

### 29. *VARANUS NEBULOSUS* (Gray).

Patani, Nakon Sitamarat and Patiyu.

### 30. *VARANUS SALVATOR* (Laur.).

Patani and Nakon Sitamarat.

## LACERTIDE.

### 31. *TACHYDROMUS SEXLINEATUS* Daud.

Maprit and Klong Bang Lai, Patiyu, Klong Wang Hip, Nakon Sitamarat, and Bangnara, Patani.

The sexes in adult life can be easily distinguished, the male being more strongly coloured than the female. The light dorso-lateral band, with its black edging, is inconspicuous or almost absent in the female, and the general colour is distinctly paler. Young ones resemble the female in colouration.



In captivity these lizards soon become tame. I have not found the tail brittle, as has been stated.

SCINCIDE.

32. *MABUIA MACULARIA* (Blyth).

Bangnara, Patani, 5 specimens; Nakon Sitamarat, 5 specimens; Maprit and Klong Bai, 6 specimens.

This lizard appears to be not uncommon in the northern part of the Peninsula, although it is rare further South. Elsewhere in Siam it is quite common. One of the specimens was taken near the top of Khao Wang Hip, but it is unusual to find this species ranging at any elevation.

33. *MABUIA MULTIFASCIATA* (Kuhl).

Specimens of this common skink were obtained at all the localities visited.

34. *MABUIA PRAESIGNE* (Bouleng.).

Smith, Journ. Nat. Hist. Soc. Siam, II, p. 55 (1916).

Khao Wang Hip (upper camp), Nakon Sitamarat, 2 adults, 1 young one.

In all three specimens there is a small extra shield interposed between the frontal and the frontoparietals. In one, the parietals are not in contact.

35. *LYGOSOMA TERSUM* M. A. Smith.

Journ. Nat. Hist. Soc. Siam, II, p. 44.

Khao Wang Hip (lower camp), Nakon Sitamarat, 2 specimens.

36. *LYGOSOMA MACULATUM* (Blyth).

Maprit and Patiyu, 4 specimens.

38 scales round the body. The lateral band is broad and jet black, interrupted, in one of the specimens, by white spots.

37. *LYGOSOMA OLIVACEUM* (Gray).

Bangnara, Patani, 1 specimen.

38. *LYGOSOMA BOWRINGI* (Günth.).

Bangnara, Patani, 3 specimens.

39. *LYGOSOMA HERBERTI* M. A. Smith.

Journ. Nat. Hist. Soc. Siam, II, p. 45.

Khao Wang Hip (lower camp), Nakon Sitamarat, 1 specimen.



# 40. *LYGOSOMA VITTIGERUM* Bouleng.

Smith, Journ. Nat. Hist. Soc. Siam, I, p. 154.

Klong Bang Lai, 2 specimens.

In these specimens, as in all those that I have seen from other parts of Siam, there is a pale dorso-lateral stripe in addition to the vertebral one. It commences above the eye, and terminates near the posterior part of the body. It is narrower than the vertebral stripe and is less clearly defined, its outer border of black being distinct only anteriorly.

# 41. *LYGOSOMA MELANOSTICUM* Bouleng.

Fauna Brit. Ind. Reptiles, p. 199.

Khao Wang Hip Hip (upper camp) Nakon Sitamarat, 7 specimens.

The type specimens of this lizard are from hills in Northern Tenasserim, between 3,300 and 4,000 ft. high. My specimens differed from them in several small details, and the following remarks supplement Mr. Boulenger's original description of this species.

Praefrontals separated or forming a median suture. Frontal shorter than the frontoparietal and interparietal together. Nuchals small or absent. 36 to 38 (36 in one specimen only) scales in mid-body. 16 to 20 subdigital lamellae.

Colour (in spirits). Above, light or dark brown, with small black spots which are mostly collected in the mid-line. Starting from the nostril and continued above the tympanum along the upper half of the flank to the base of the tail, is a black band, indented and spotted with very light brown; lower half of the flank, white, with small black specks; below, white. Limbs and sides of tail, speckled with whitish. Lips with dark bars at the sutures.

# 42. *LYGOSOMA CHALCIDES* (Linn).

Nakon Sitamarat, 1 specimen; Bangnara, Patani, 8 specimens.

# 43. *LYGOSOMA ANGUINOIDES* Bouleng.

Journ. Nat. Hist. Soc. Siam, I, p. 67.

Maprit and Kang Lai, Patiye, 4 specimens.

All of them were taken beneath fallen timber. Largest, head and body, 69 mm., tail 64.

To Mr. Boulenger's original description of this species which



was drawn up from a single specimen, the following may be added. Rostral in contact with the frontonasal, or shut off by the nasals. Three or four supraoculars, five or six upper labials. The type is from Bangtaphan, but neither in a second specimen from this locality, nor in any of the four from Patiyu, is the 1st supraciliary in contact with the frontal. One specimen has only 22 scales round the middle of the body.

#### OPHIDIA.

##### TYPHLOPIDÆ.

#### 44. *TYPHLOPS LINEATUS* Boie.

Bangnara, Patani.

This species has not been met with farther north.

#### 45. *TYPHLOPS NIGROALBUS* Dum. & Bib.

Bangnara, Patani, 4 specimens.

Three of them have 25 scales in mid-body, the other, 24.

##### XENOPELTIDÆ.

#### 46. *XENOPELTIS UNICOLOR* Reinw.

Bangnara, Patani, and Klong Wang Hip, Nakon Sitamarat.

##### COLUBRIDÆ.

#### 47. *POLYDONTOPHIS GEMINATUS* (Boie).

Bangnara, Patani.

The largest specimen measures 460 mm. in total length, tail 185. A still larger one is 320 mm. in body length, but has the tail broken. Mr. Aagaard tells me it is a common snake upon the estate. North of the Peninsula it is replaced by *P. collaris*.

#### 48. *TROPIDONOTUS PISCATOR* (Schneid.).

Bangnara, Patani and Klong Wang Hip, Nakon Sitamarat.

#### 49. *TROPIDONOTUS SUBMINIATUS* Schleg.

Bangnara, Patani, and Klong Wang Hip, Nakon Sitamarat.

This snake, appears to rare in the Peninsula, but is very common further North.

#### 50. *TROPIDONOTUS CHRYSARGUS* Schleg.

Maprit and Klong Bang Lai, Patiyu, 2 specimens; Khao Wang Hip (upper and lower camps), 3 specimens.



A very variable snake in colouration. Not one of the specimens obtained was exactly like the others.

# 51. *TROPIDONOTUS TRIANGULIGERUS* Boie.

Khao Wang Hip (lower camp), Nakon Sitamarat. Klong Bang Lai, Patiyu.

This snake, common in the Peninsula, has not been found north of Patiyu.

# 52. *TROPIDONOTUS NIGROCINCTUS* Blyth.

Günther, Rept. Brit. Ind., p. 269 (1864); Blgr. Fauna Brit. Ind. Rept., p. 346 (1890); idem, Cat Sn. Brit. Mus., I, p. 255 (1893); Smith and Kloss, Journ. Nat. Hist. Soc. Siam, I, p. 244 (1915).

Klong Bang Lai, Patiyu, 1 half-grown specimen.

Colour (in spirits). Above, olive-green anteriorly, brownish-green posteriorly, with narrow black cross bands (33 upon the body) which are often interrupted vertebally. Nape with a broad pale (? pink) band extending on to the sides of the head as far as the eyes, and succeeded by an equally broad band of black; an oblique streak below the eye and another behind it. Below whitish; hinder part of belly and tail thickly powdered with grey.

The pale (? pink) band across the nape is a juvenile character; in half-grown individuals it may be still well marked, but disappears entirely in adult life. Günther mentions the presence of this band in his description, but in the Fauna of British India, and in the Catalogue, it is omitted.

# 53. *TROPIDONOTUS INAS* Laidlaw.

Khao Wang Hip (upper camp), Nakon Sitamarat, 1 ♂ specimen.

The type and hitherto only known specimen of this snake was obtained by the Skeat expedition to the Malay Peninsula in 1899-1900.

To Mr. Laidlaw's original description the following may be added:—Frontal longer than its distance to the end of the snout; 3 post-oculars; 9 upper labials, fourth to sixth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are as long as the posterior; scales keeled, the outer row not quite as strongly as the others. Ventrals 148, subcaudals 103. Total length 380 mm., tail, 120. Maxillary teeth, 24 in number.

Colour (in spirits). Above, very dark olive brown, with in-



distinct black spots, and a series of small yellow spots on either side in the anterior part of the body. Lips white, with black spots; a yellowish-white streak from the gape to the lateral yellow spots. Below white, with a squarish black spot at the outer margin of each ventral shield, these spots being more or less confluent with each other and with the colour upon the flanks. Head above, light brown, with lighter and darker variegations. Tongue black, with a yellow bar at the fork.

54. *MACROPHISTODON RHODOMELAS* (Boie).

Khao Wang Hip (lower camp) Nakon Sitamarat, 1 specimen.

This species has not been found north of this locality.

55. *LYCODON LAOENSIS* Günth.

Bangnara, Patani and Klong Wang Hip, Nakon Sitamarat.

Ventral count of the Bangnara specimen, 170.

56. *LYCODON SUBCINCTUS* Boie.

Mocquard, *Les Reptiles de L'Indo-Chine*, p. 47 (1907).

Bangnara, Patani, 1 specimen.

I have not met this species further north, nor does Boulenger mention that it occurs north of the Peninsula. Mocquard, however, records it from Indo-China, and if this is so, it should be found elsewhere in Siam.

57. *ZAOCYS CARINATUS* (Günth).

Bangnara, Patani, 2 specimens; Khao Wang Hip (lower camp), Nakon Sitamarat, 1 specimen.

Previously recorded in the Peninsula only from Singapore and Perak, the range of this fine snake is now considerably extended.

58. *ZAMENIS KORROS* (Schleg.).

Patani and Nakon Sitamarat.

59. *COLUBER MELANURUS* Schleg.

Günther, *Rept. Brit. Ind.*, p. 245 (1864).

Bangnara, Patani, 1 specimen.

The distribution of this snake is stated to be from S. China and Burma to the Malay Peninsula and Archipelago. In the Peninsula it is generally distributed, but I have never met with it in Siam, in spite of constant collecting all over the country, except in the locality above mentioned. In the Catalogue of Snakes in the British



Museum there is a specimen labelled China, presumably the one referred to by Günther as "said to be from China." All the others in the collection are from the Malay Peninsula and Archipelago. Mocquard does not mention it in his list from Indo-China. Unless, therefore, other specimens have since been obtained to support the statement, it would appear probable that this snake does not range north of the Malay Peninsula.

60. *COLUBER RADIATUS* Schleg.

Bangnara, Patani, Singgora.

61. *COLUBER OXYCEPHALUS* Boie.

Bangnara, Patani, 1 specimen.

62. *DENDROPHIS PICTUS* (Gmel.).

Patani and Nakon Sitamarat.

63. *DENDROPHIS FORMOSUS* Boie.

Bangnara, Patani, 1 specimen.

64. *DENDRALAPHIS CAUDOLINEATUS* (Gray).

Cat. Snakes. Brit. Mus., II, p. 90 (1894); Wall, Poison. Terrest. Snakes Brit. Ind. Domin., p. 17 (1913), footnote.

Bangnara, Patani, 1 specimen.

It has not been obtained elsewhere in Siam. The distribution which is recorded of this snake, as having been found in Southern India, but otherwise not outside the Malayan region, is remarkable. The Indian record is based, I believe, on Col. Beddome's specimen from Wynad, Malabar, but as Wall has now shown, quite a number of snakes recorded by the Colonel as coming from S. India, do not belong there.

65. *SIMOTES PURPURASCENS* (Schleg.).

Bangnara, Patani, 4 specimens.

All of them have 19 rows of scales in mid-body. I have not met with this snake in any other part of Siam.

66. *PSEUDORHABDIUM LONGICEPS* (Cantor).

Bangnara, Patani, 9 specimens.

Mr. Aagaard tells me it is a common snake upon the estate. A female obtained in July contained 2 eggs, narrow and much elongated. The species is not known further north.



67. *CALAMARIA VERMIFORMIS* Dum. & Bib.

Bouleng. Cat. Snakes, II, p. 333 (1894).

Colour. Above, very dark purplish-brown, the colour ending in a clear line of demarcation two rows of scales above the ventrals. Upper labials, throat and belly, yellow, with broad dark transverse bars, which commence behind the neck, and are confined to the ventral scales. This presumably is Var. D. of the Catalogue.

The only other recorded locality for this snake in the Peninsula is the Larut Hills, Perak, at 4,000 ft. and the three specimens in the Selangor Museum from this locality, also belong to Var. D.

Var. F. is a further development of Var. D., in which the yellow interspaces between the transverse bands have been filled in, so as to make the belly entirely dark. This form in the process of making is shown in one of my specimens, as well as in two of those in the Selangor Museum, by a certain amount of dark mottling in each yellow interspace.

## HOMALOPSINÆ

68. *HYPSIRHINA PLUMBEA* (Boie).

Bangnara, Patani.

69. *HYPSIRHINA ENHYDRIS* Schneider.

Bangnara, Patani.

70. *HOMALOPSIS BUCCATA* (Linn.).

Bangnara, Patani.

## DIPSADOMORPHINÆ

71. *DIPSADOMORPHUS DENDROPHILUS* (Boie).

Bangnara, Patani, 2 specimens; Khao Wang Hip (lower camp), Nakon Sitamarat, 1 specimen.

The species has not been met north of the last named locality. Like *D. cyaneus*, it will devour other snakes. One of the individuals from Bangnara, had eaten a *Chrysopalea ornata* some 4 inches longer than itself.

72. *DIPSADOMORPHUS CYNODON* (Boie).

Bangnara, Patani, 1 specimen.

It accords very closely with var. B. in the Catalogue.

73. *PSAMMODYNASTES PULVERULENTUS* (Boie).



Patani and Nakon Sitamarat.

74. *DRYOPHIS PRASINUS* Boie.

Bangnara, Patani.

75. *CHRYSOPELEA ORNATA* (Shaw).

Bangnara, Patani, 1 specimen.

Found, as already mentioned, in the stomach of *D. dendrophilus*.

ELAPINE

76. *BUNGARUS FASCIATUS* Schneid.

Bangnara, Patani, 2 specimens.

One of them is interesting in that it shows, in most of the yellow bands, a slight amount of subdivision by central mottling, similar to that which may be found in the allied *B. candidus*.

77. *NAIA TRIPUDIANS* Merrem.

Bangnara, Patani.

78. *NAIA BUNGARUS* (Cantor).

Bangnara, Patani.

79. *DOLIOPHIS BIVIRGATUS* (Boie).

Bangnara, Patani, 1 specimen.

80. *DOLIOPHIS INTESTINALIS* (Laur.).

A single specimen of this snake (var. *trilineatus*), was found dead on the summit of Khao Wang Hip.

AMBLYCEPHALIDÆ.

81. *AMBLYCEPHALUS MOLLENDORFFI* (Boettg.).

Bangnara, Patani.

Mr. Aggaard tells me it is a common snake upon the estate. One specimen has 57 sub-caudal shields only.

82. *AMBLYCEPHALUS CARINATUS* Boie.

Blgr. Cat. Snakes Brit Mus., III, p. 445; Barbour, Mem. Mus. Comp. Zool. Harvard, XLIV, p. 138 (1912).

This snake has already been recorded from Cochin-China, Burma, and Java, and its occurrence in Siam and the Peninsula was to be expected.

Ventrals in one specimen, 190; subcaudals in another, 82. In other respects they agree entirely with the description. Barbour's



suggestion that this species would be found to be a highland form is not supported by its distribution in Siam.

83. *ANCISTRODON RHODOSTOMA* (Boie).

Smith, Journ. Nat. Hist. Soc. Bombay, XXIII, p. 788.

Klong Wang Hip, Nakon Sitamarat ; Bangnara, Patani.

Mr. Aagaard tells me this snake is one of the commonest upon the estate. It is so numerous he says, that on some occasions, when weeding, the coolies have killed as many as eight or ten in the course of a day. It is much feared by them on account of its sluggish habits, as it will not move out of the way when disturbed, and if approached too closely, bites readily. From the accounts which he has given me of men who have been bitten, I gather that the poison is entirely local, and very similar in its action to that of *Lachesis gramineus*. It is perhaps somewhat more powerful, for whereas in many cases of bite from the latter, the symptoms are so trivial as not to require any treatment, in all the cases quoted by Mr. Aagaard, there has been considerable pain and swelling for some days afterwards.

The largest specimen I know of is one he obtained, a female, measuring 920 mm. in total length.

84. *LACHESIS WAGLERI* (Boie).

Bangnara, Patani, 1 specimen.

I have not heard of this snake being found further North.

85. *LACHESIS GRAMINEUS* Shaw.

Bangnara, Patani.

BATRACHIANS.

RANIDÆ.

1. *OXYGLOSSIS LIMA* (Gravenh.)

Klong Wang Hip, Nakon Sitamarat.

2. *OXYGLOSSIS LAEVIS MARTENSI* Peters.

Klong Wang Hip, Nakon Sitamarat, 1 specimen ; Maprit and Klong Bang Lai, Patiyu, 4 specimens ; Bangnara, Patani, 4 specimens.

The reasons for considering the continental form of this frog to be entitled to rank as a distinct race from the Archipelagic one, have been given elsewhere in this number of the Journal.



### 3. RANA DORIAE Bouleng.

This frog was fairly common on Khao Wang Hip, and was obtained both at the foot of the hill, as well as at varying elevations on the hill.

### 4. RANA LIMBORGI W. Slater.

P. Z. S., 1892, p. 344

Maprit and Klong Bang Lai, 13 specimens; Klong Wang Hip, Nakon Sitamarat, 1 specimen.

The type specimen of this frog, a solitary one, was obtained in Tenasserim. In Patiyu it was apparently fairly common, as evidenced by the number of specimens obtained there; and I have since examined others from the hills near Prae, in Northern Siam, where it also appears to be common.

My specimens differ from the original description in the following points:—Canthus rostralis, although obtuse, distinct, loreal region oblique and slightly concave, nostril nearer the tip of the snout than the eye, tympanum  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye, the tips of the fingers and toes dilated into small, but very distinct, discs. No lateral fold.

Colour. Greyish or brownish, usually with black specks and larger, dark markings. A dark band passing through the nostril, the eye, and along the supra-tympanic fold. Hind limbs with narrow cross-bars. Some with a yellow vertebral line. Lips with dark vertical bars. Below, whitish or yellowish; throat sometimes speckled with brown. Largest, from snout to vent, 33 mm.

### 5. RANA MACRODON Dum. & Bib.

Khao Wang Hip (upper and lower camps), 5 specimens; Maprit and Klong Bang Lai, Patiyu, 17 specimens.

### 6. RANA LIMNOCHARIS Wiegman.

Ferguson, Journ. Nat. Hist. Soc. Bombay, XV, p. 502, pl. A (1903) tadpole.

Specimens of this common frog were obtained at all the localities visited, except upon the hill.

The tadpole has been described by Ferguson from specimens obtained in Southern India, and as such, it has been quoted by Boulenger in his volume on the Reptiles and Batrachians of the Malay Peninsula.



The tadpole, which I have bred out in Siam, however, is so entirely different from his, that I feel quite sure we cannot be referring to the same creature.

I have verified my own conclusions with specimens taken from widely separated localities, and have kept the young frogs until they were sufficiently big to avoid any mistake in their identification. The result is, I can only conclude that some error has crept into Mr. Fergusson's article, and that he has inadvertently described another species.

#### DESCRIPTION OF THE TADPOLE.

Head and body ; length one and a half, to one and three quarter times its breadth, snout rounded. Nostrils nearer the tip of the snout than the eye. Eyes towards the upper surface of the head, looking outwards and upwards, about twice as far apart as the nostrils \*. Spiraculum sinistral, directed backwards and upwards, nearer the eye than the vent. Anal tube straight, moderately long, opening on the right hand side of the caudal membrane. Mouth, subterminal, beak edged with black, lips with short papillae at the sides, longer ones below, with a distinct gap in the mid-line. Two series of teeth in the upper jaw, the first long and uninterrupted, the second broadly interrupted ; below, three series of teeth, the lowest short, all uninterrupted. Tail nearly, or quite twice the length of the head and body, four times as long as high, tip obtusely pointed ; crests moderate, slightly convex, upper crest twice, or nearly twice, the depth of the lower, not extending on to the back. Toes webbed as in the adult.

Colour ( in life ). Above, olive, speckled with black ; posterior half of the tail usually with dark bars, or almost entirely black, sometimes reddish ; below white.

Dimensions :—Prae specimens ( May ). Total length, 33 mm., head and body 12 ; depth of tail 5.5.

Near Bangkok ( July ). Total length, 42 mm. ; head and body, 14 ; depth of tail, 6.

*Rana limnocaris* in Siam, breeds throughout the rainy season, and the tadpoles may be obtained in abundance from May to October. They are to be found in small, swampy patches of ground, where the water is quite shallow, and where usually there is plenty of grass and

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\* More than twice in one brood, less than twice in another.



rushes growing. They feed upon vegetable and dead animal matter. The prominent glandular folds in the skin develop with the protrusion of the fore-limbs, and the young ones on leaving the water resemble their parents in colouration.

# 7. RANA GLANDULOSA Bouleng.

Bangnara, Patani, where it appears to be not uncommon.

# 8. RANA MACRODACTYLA Günth.

Bangnara, Patani.

# 9. RANA ALTICOLA Bouleng.

*Rana pipiens*, Jerdon, Proc. As. Soc. Bengal, (1870,) p. 83 (name preoccupied).

*R. alticola*, Blgr, Cat. Bat. Sal, p. 62 (1882); idem. Ann. Mus. Genova (2) XIII, p. 334 (1893)

*R. tytléri* (non Theob.), Blgr, Fauna Brit. Ind. Rept. p. 458 (1890).

*R. nigrovittata*, part., W. Slater, P. Z. S., 1892, p. 345.

Klong Bang Lai, Patiyu, 6 specimens.

Previously known from the Khasi Hills and Moulmein, this frog is new to the Peninsula.

Colouration. Above, from very light to dark brown; sides of the head and body, darker brown, most strongly marked in front. A white or pink stripe bordering the upper lip. Limbs without dark cross bands or only just apparent. Below whitish, the throat and chest more or less thickly powdered with dark grey. A white median line down the throat. Largest, snout to vent, 52 mm.

# 10. RANA HUMERALIS Bouleng.

Fauna Brit. Ind. Rept. p. 460.

Khao Wang Hip (lower camp), Nakon Sitamarat, 1 ad. ♂, 1 ad. ♀, 1 young one.

This frog is also new to the fauna of the Peninsula, being previously known only from Burma.

The young specimen is pink above, with dark brown flanks, the two colours meeting in a clear line of demarcation at the dorso-lateral fold, which is itself bright pink. The throat and breast have small dark spots. In the female there are large pinkish patches on the back, flanks and limbs. The male has no pink at all upon it, and agrees entirely with the description in colouration.

# 11. RANA ERYTHRAEA (Schleg.).

Klong Wang Hip and Bangnara.



12. *RANA NIGROVITTATA* (Blyth).

Smith and Kloss, Journ. Nat. Hist. Soc. Siam, I, p. 249 (1915);

Smith, Journ. Nat. Hist. Soc. Siam, II, p. 42 (1916) tadpole.

Klong Bang Lai, Patiyu, 10 specimens.

Although common in many parts of Siam, this frog appears to be rare in the Peninsula.

13. *RANA LABIALIS* Bouleng.

Khao Wang Hip ( lower camp ), Nakon Sitamarat, 2 specimens; Maprit and Klong Bang Lai, Patiyu, 4 specimens.

Previously known in the Peninsula as far north as Perak, the range of this frog is now considerably extended.

14. *RHACOPHORUS LEUCOMYSTAX* (Graven.).

Obtained at most of the localities visited.

## ENGYSTOMATIDÆ

15. *CALOPHYRUS PLEUROSTIGMA* Tschudi.

A fine series of 28 specimens of this interesting Batrachian were obtained at Klong Bang Lai, in Patiyu. They were found on the banks of the stream, hiding beneath dead herbage or bits of drift-wood.

The hind limb in all these specimens is longer than stated, reaching to between the eye and the nostril, or to beyond the tip of the snout. The snout has a small, but distinct, tip. Toes,  $\frac{1}{4}$  to  $\frac{1}{3}$  webbed. A glandular fold, similar to the fold along the side of the body, passes along the back of the thighs above the anus.

Colour. Above, light or dark pinkish-brown or pinkish-grey. A dark mark upon the head, commencing between the eyes, and narrowing over the occiput, where it divides into two broad bands which travel backwards to the inset of the hind leg. These bands are beset with large black spots, and either the bands or the spots may be entirely absent, but never both together. A black spot at the inset of the thigh is constant. Sides of the head and body below the lateral fold, dark brown; canthus rostralis, lateral fold, and fold behind the thighs, light pink. Throat, chest, and upper part of abdomen, pink, more or less thickly powdered with grey, and with large white, black-edged spots, which are glandular in structure. Legs with dark cross-bars.

I have taken this frog also at the foot of Khao Sebah, S. E.



Siam, in situations similar to those in which they were obtained by my collectors at Klong Bang Lai. The secretion of their skin is very poisonous, and any other frogs put into a bag with them, rapidly succumb.

16. *MICROHYLA INORNATA* Bouleng.

Maprit and Klong Bang Lai, Patiyu, 14 specimens.

Boulenger gives the length of this frog as 23 mm., and this is usual for Siam, where it is common. Some of the specimens from Patiyu are unusually large, two of them measuring 27 mm., in length, and two others 25.\*

17. *MICROHYLA PULCHRA* (Hallow).

Bouleng., Cat. Bat. Sal., p. 165 (1882); Smith, Journ. Nat. Hist. Soc. Siam, II, p. 39 (1916), tadpole.

Maprit, Patiyu, 1 specimen.

This frog which is common throughout the greater part of Siam, has not been previously recorded from the Peninsula.

18. *MICROHYLA ORNATA* (Dum. & Bib.).

Maprit and Klong Bang Lai, Patiyu, 4 specimens.

19. *MICROHYLA ACHATINA* (Boie).

Smith, Journ. Nat. Hist. Soc. Siam, II, p. 37 (tadpole).

Patiyu and Patani.

20. *MICROHYLA ANNECTENS* Bouleng.

Klong Bang Lai, Patiyu, 1 specimen.

The only other record of this frog in the Peninsula is from the Larut Hills at about 4,000 feet. My specimen is 20 mm. in length. The dark mark upon the back is hardly distinguishable; head in front of the transverse bar between the eyes, pale grey; there is a very thin, pale, vertebral line. The lips have dark spots, and a black streak runs from behind the eye, above the white one.

21. *MICROHYLA BERDMORII* (Blyth).

Maprit and Klong Bang Lai, 17 specimens.

22. *BUFO MACROTIS* Bouleng.

Fauna Brit. Ind., Rept., p. 502.

Muang Sai, Patani, 1 specimen.

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\* Since writing the above I have seen several more specimens from near Korat, quite as large as those from Patiyu.



The distribution of this toad in Siam appears to be very local. Flower found it fairly numerous at Krabin, in S. E. Siam, in 1897, and my collectors who went there last year, found it still numerous. Mr. Gairdner obtained a specimen at Sai Yoke, on the western boundary, and the Patani specimen was found upon a small sandy hill, some 300 feet high, close to the sea-shore.

Colour (of the Patani specimen); dull brown, with irregular scattered black marks, and a few small spots of light yellow. Hind limbs with dark cross bars. Below dirty whitish, with brown speckles.

### 23. *BUFO ASPER* Gravenh.

Maprit, Patiyu, 5 specimens; Khao Wang Hip (lower camp), Nakon Sitamarat, 3 specimens.

All of them differ slightly from the description in that the first finger is a little longer than the second, and the toes have two subarticular tubercles. The young are stated to be lighter in colour than the adults, but two quite young ones obtained at Nakon Sitamarat are almost black above.

### 24. *BUFO MELANOSTICUS* Schneid.

Patani and Nakon Sitamarat.

### 25. *BUFO PARVUS* Bouleng.

Smith, Journ. Nat. Hist. Soc. Siam, II, p. 42 (tadpole).

Khao Wang Hip (lower camp) Nakon Sitamarat; Maprit and Klong Bang Lai, Patiyu.

In all three localities it appeared to be fairly common. The specimens were very variable in colouration. Some were very light brown, others very dark brown, one adult had a strong pink tinge all over the upper surface of the body and limbs. Black spots on the back present in some, cross bars on the limbs indistinct. Below yellowish white, more or less thickly spotted with dark grey. Largest 52 mm., in length.

### 26. *MEGALOPHYRYS MONTANA* Kuhl.

Khao Wang Hip (upper camp), 2 specimens.

### 27. *MEGALOPHYRYS NASUTA* (Schleg.).

Tanjong Mas, Patani, 1 specimen.

### 28. *MEGALOPHYRYS HASSELTII* (Tschudi).

Klong Bang Lai, Patiyu, 2 specimens.



Length, 77 mm.

29. *ICTHYOPHIS GLUTINOSUS* (Linn.).

Klong Bang Lai, Patiyu, 15 specimens.

Apparently common in this neighbourhood, being found in the earth along the banks of the stream. Boulenger records it as a hill species, and apparently not common anywhere, but its burrowing habits probably tend to make it appear less numerous than it really is. In Bangkok it is not uncommon. Throughout the rains, and particularly after a stormy night, I seldom fail to see one or more of these creatures lying in the road, having been killed under the impression that it was a snake. A friend of mine once undertook to get one of these creatures for every square metre of earth dug up in his grounds, choosing the land by the side of water. Only four metres were dug, but five specimens were obtained.



## ON THE FROGS OF THE GENUS OXYGLOSSIS.

BY MALCOLM. A. SMITH. M. R. C. S., L. R. C. P.

WITH A PLATE.

In the genus *Oxyglossis*, three species have been included, namely:—*O. lima* (Gravenh.), *O. laevis* Günther, and a third form, doubtfully distinct from the latter, and described by Peters from specimens obtained in Bangkok, under the name of '*O. martensi*'.<sup>1</sup> This latter was separated from *laevis* on three points:—the webs of the toes deeply emarginate, a rather indistinct metatarsal tubercle, and warts on the back and limbs. None of these points, however, are of specific value.

Writing of *O. laevis* when describing the tadpole, Mr. Boulenger remarked.<sup>2</sup> "Adult and larval specimens were collected by Mr. Everett in Southern Celebes, at an altitude of some 2,000 feet. The largest specimen measures 42 mm. from snout to vent. The toes may be fully webbed, with rectilinear membrane, or the webs may be deeply emarginate, as described by Peters in *O. martensi* from Siam, which I am now very much inclined to think is based on an individual variation of *O. laevis*."

In *O. laevis* also there may be warts on the skin, while *O. martensi* may have the skin smooth.

I have always been struck, however, when examining these frogs in Siam, by the difference in size which exists between them and in those recorded from the Archipelago. Through the kindness of the authorities of the Selangor Museum, Kuala Lumpor, and The Raffles Museum, Singapore, I have recently been able to examine the specimens in their collection, and to compare those from the Malay Peninsula and Archipelago, with my own large series from Siam.

Siamese specimens seldom exceed 28 mm. in length, and those that I have seen from the Peninsula (Nakon Sitamarat, Singgora, Patani, Jalor, Perak), have not been any larger. In the Archipelago

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1. Mon. Berl. Ac., 1867, p. 29.

2. Boulenger, P. Z. S. 1897, p. 228.



on the other hand, as just mentioned, they may attain a length of 42 mm., and the general build is in proportion

With regard to the toes, the web in specimens from the Peninsula and Siam is always emarginate, and never full as appears to be usual with those from the Archipelago.

In colouration there appears to be no difference, but individuals from the Peninsula and Siam may have a large orange or yellow patch behind the eyes.

The tadpole of this frog in Siam, is less than half the size of that described by Mr. Boulenger from the Celebes.

For these reasons, therefore, it would be convenient to separate this species into two races, a large or southern one inhabiting the islands of the Malayan Archipelago, and a small or northern one, ranging through the Malay Peninsula and Siam, into Burma and Indo-China. To this latter race the name *Oxyglossis lucris murtensi* may be applied.

#### THE TADPOLE OF OXYGLOSSIS LIMA.

Head and body, length twice, or nearly twice its breadth, snout long, obtusely pointed. Nostrils equidistant between the eyes and the tip of the snout. Eyes towards the upper surface of the head, looking outwards and upwards, twice as far apart as the nostrils. Spiraculum sinistral, directed straight backwards, nearer the vent than the eye, long and prominent in life. Anal tube very short, median. Mouth small, terminal, without papillae; lower lip vertically horse-shoe shaped, upper lip, a small rounded flap; no teeth; beak entirely black, lower mandible deeply semilunar in shape. The lower lip, which occupies the greater part of the mouth, itself projects from a sheath of skin, which is formed by, and is part of, the skin of the rest of the body.

Tail sharply pointed, very high at its commencement where it rises almost abruptly from the base of the tail, diminishing gradually as it passes backwards: at its highest point about four times as deep as the lower crest, which is very shallow. Toes webbed as in the adult.

Colour (in life). Light olive above, with darker markings; a dark streak through the eye passing backwards, and dark patches at the base of the tail. Caudal membranes handsomely veined and marbled with shades of brown, Below, white.



Dimensions. Total length, 33 mm., head and body 11.

A feature of the tadpole is the high, festooned upper crest, which gives it a very handsome appearance.

THE TADPOLE OF *OXYGLOSSIS LAEVIS MARTENSI*.

Similar to *O. lima* except:—

Upper caudal membrane, low, hardly any deeper than the lower, slightly convex.

Upper lip shorter, so that a considerable portion of the lower lip can be seen when the head is viewed from above.

Toes webbed as in the adult.

Size much smaller; total length, 23 mm., head and body 8.5 mm.

Colour (in life) Olive above, finely speckled and streaked with black. A dark band through the eye, and a light golden one beneath, along each side of the head. Tail with light and dark variegations. Below thickly speckled with black and white.

The tadpole of *O. laevis* from the Celebes as described by Mr. Boulenger is 51 mm. in total length, but in other respects appears to agree very closely, with *O. l. martensi*.

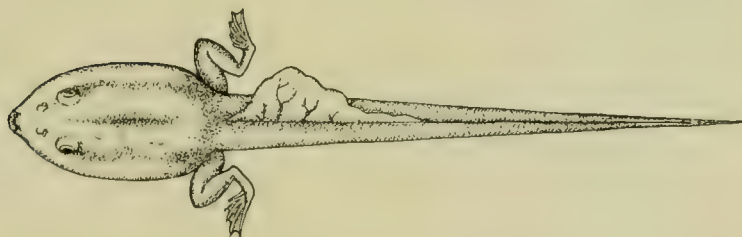
Both the tadpoles just described may be found in Bangkok throughout the greater part of the rainy season. In their habits they are much alike. Both are sluggish, and hardly ever move about, remaining quietly at the bottom of any ditch or pool they happen to live in. Unlike other tadpoles that I know, they have a habit of sprawling out their hind-limbs in an ungainly manner, and of using them also as a means of locomotion, preferring to crawl slowly about by their aid, rather than use their tails. They are carnivorous feeders, preying on mosquito larvae, other small tadpoles etc.

As a genus, these tadpoles seem very distinct, the long, pointed snout, and the small, terminal mouth, with large beak but no teeth, serving to distinguish them at once from tadpoles with the Ranid or Engystomatid type of mouth.

The embrace of the parent frog (I have only seen that of *O. lima*), is axillary.

Both species of frog are widely distributed throughout Siam. In the southern portion of the Malay Peninsula they appear to be





**OXYGLOSSIS LIMA.**



MOUTH

**O. LAEVIS MARTENSI.**







rare, but are more numerous in the northern half. In Siam proper they are exceedingly common. I have no records of any specimens north of Prae, but there is no reason to believe that their range does not extend beyond this. In Bangkok both are plentiful.

*O. lima* is strictly aquatic in its habits, and I have never seen it away from water. It haunts the open rice-fields and small ponds. Its cry is a harsh, chattering note, and it is the only frog in Bangkok that may be heard calling at any time of the year. It feeds chiefly upon ants and spiders.

*O. laevis martensi*, although never far from water, is seldom to be found in it, preferring the road-side ditches, where it seeks concealment in the long grass or dense foliage by the water-side. From this habit, as well as from its small size, it is seldom seen and is a difficult frog to catch. Once its note can be recognized, however, an unobtrusive and not unmusical "chink, chink" often repeated, it is amazing what numbers of these creatures reveal themselves. Every compound, every road, in fact, practically every patch of green throughout the whole city, seems to harbour some of them. Throughout the rainy season they may be heard at any hour of the day or night, but in the dry weather they are silent. They remain active, however, throughout the year.



NOTE ON A RARE SEA SNAKE (*THALASSOPHIS ANOMALUS*)  
FROM THE COAST OF SIAM.

BY MALCOLM. A. SMITH. M. R. C. S., L. R. C. P.

WITH A PLATE.

*Thalassophis anomalus*, Schmidt, Abhandl. Nat. Hamb., II, p. 81, pl. iv (1852); Bouleng., Cat. Sn., III, p. 269 (1896). Wall, Monograph Sea-Snakes, p. 244 (1909).  
*Hydrophis anomala*, Günther, Rept. Brit. Ind., p. 379 (1864); Jan, Icon. Gén. 40, pl. iv, fig. 1. (1872).

The occurrence of this snake off the coast of Siam is of considerable interest. Hitherto it has been known only from the islands of the Malayan Archipelago (Java, Sumatra, Borneo and the Moluccas) from whence some nine specimens have been obtained, all of which are distributed in the Continental Museums.

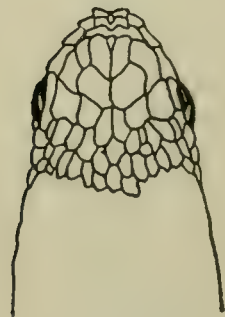
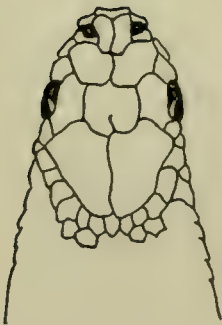
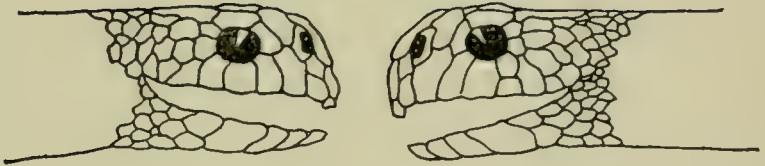
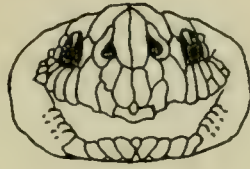
At the end of March this year, I obtained two specimens at the mouth of the Chantabun river, S. E. Siam; and later on, through an old diver living there, procured eight more. All of them were caught in the fishing baskets just within the mouth of the river.

My first two specimens agreed entirely, except in colouration, with Schmidt's description of this species, but an examination of a of a larger number showed small differences, as might have been expected. I have therefore given a description of mine in full, drawn up from the ten specimens.

Poison fangs, followed after a small interval, by 5 smaller teeth gradually diminishing in size, all of which show the presence of grooves.

Bodily configuration, moderately stout. Eye equal to or slightly less than its distance from the mouth. Rostral broken up into 4 or 5 pieces. Internasals narrow, elongate, equal to or shorter than the praefrontals. Frontal small, variable as regards length and breadth, sometimes partially or completely divided. Nostril large, lying entirely within the posterior of the two nasal shields. 1 prae- and 1 or 2 post-oculars. Temporals small, 2+3 or 3+3. Upper labials 7 to 9, usually the third, fourth and fifth entering the eye; horizontal division of the third and (or) fifth sometimes present; prae-frontal usually touches the second. Four lower labials in contact with the





THALASSOPHIS ANOMALUS.







sublinguals; posterior pair of sublinguals half the size of the anterior and separated by 2 scales. Symphisial small. 28 to 30 scales round the neck, 33 (in one 35) round the greatest diameter of the body, hexagonal, juxtaposed, with a strong tubercle or short keel. Ventrals small, equal to or a little broader than the adjacent scales, and distinguished by the presence of a double tubercle or short keel.

Colour (in life). Above, pale grey, with 32 to 36 (3 to 4 on the tail) dark cross bars, which are much broader than their interspaces, and taper to a point upon the sides. Below white. There are no annuli as in the specimens described from the Archipelago.

The one young specimen obtained differs in no way from the adults, except that the markings are more pronounced.

The scales upon the head, particularly those around the snout and lips, have unusually thickened edges, so that each one seems to stand out separately. Spirit specimens, in which the tissues have shrunk, show this peculiarity only in a small degree. Minute tubercles may, or may not be present on the head scales.

Length of the largest, a ♂, 810 mm., tail 90.

I am indebted to Mr. C. L. Groundwater, for his excellent and very faithful drawings of the head.



# DIAGNOSES OF FOUR NEW SQUIRRELS FROM SIAM.

By C. BODEN KLOSS, F. Z. S.

During my recent visit to Siam ( October and November 1916 ) I obtained the four new races of squirrels of which brief diagnoses are given below. Detailed descriptions will be published later in a full account of my collection of mammals.

## 1. *Sciurus finlaysoni trotteri*, subsp. nov.

Like *S. f. folletti* of Koh Phai, but darker and practically without the buffy tinge of that race ; tail above almost clear creamy, only the extreme tip darkened.

Typical locality Koh Lan, Inner Gulf of Siam.

## 2. *Sciurus atrodorsalis tachin*, subsp. nov.

Like *S. a. atrodorsalis* from the latitude of Moulmein but considerably smaller and with a grizzled line down the centre of the chest.

Typical locality Tachin, west of Bangkok, Central Siam.

## 3. *Sciurus epomophorus inexpectatus*, subsp. nov.

Like *S. e. milleri* from Trang, Peninsular Siam, but paler ; much paler than *S. e. davisoni* from Southern Tenasserim.

Typical locality Koh Lak, Pran, S. W. Siam.

## 4. *Sciurus erythræus pranis*, subsp. nov.

Like *S. e. rubeculus* from Trang, Peninsular Siam, with a grizzled median line, but the undersurface ochraceous, never more than partially tinged with chestnut, and the tip of the tail frequently albescent.

Typical locality Koh Lak, Pran, S. W. Siam.



## ON THE CORRECT NAME FOR THE WHITE SQUIRREL OF SIAM.

BY C. BODEN KLOSS, F. Z. S.

In the first volume of this Journal I dealt with the white squirrels of Siam and of the Island of Si Chang, giving reasons why I considered that the mainland animal should be regarded as the typical form of *Sciurus finlaysoni* of Horsfield. In the Journal of the Federated Malay States Museums (vol. VII, p. 55) Mr. H. C. Robinson traverses my conclusions, and is of opinion that the island race, named by me *Sciurus finlaysoni portus*, is the typical form, while the mainland animal is in need of a name; and he proposes *Callosciurus finlaysoni tachardi* for it.

He writes:—"Mr. Kloss attempts to justify his contention by referring to the original description by Horsfield (*Zool. Res. Java*—, 1824) in which that author states that 'this species has hitherto been mentioned by Buffon alone from the following concise notice in P. Tachard's travels'—while, in addition, Mr. Kloss also refers to Anderson, who states that 'the type of *Sc. finlaysoni* was obtained in Siam by Dr. Finlayson and another was procured by the same traveler in Si Chang Island. These two squirrels are exactly alike, being white squirrels with a yellowish tinge.' The latter clause shows that Dr. Anderson did not study these two specimens in any great detail.

"Further, Mr. Kloss quotes Horsfield (*Cat. Mamm. E. Ind. Co. Mus.*, p. 154, 1851) as stating that the locality of the specimen in the Museum of the East India Company (transferred to the British Museum in 1879) was "Siam." This is, however, not strictly accurate. The habitat of the *species* is given as "Siam" while a *specimen* "A" is mentioned "from G. Finlayson's Collection during Crawford's Embassy to Siam and Hue," which is not quite the same thing.

"The whole crux of the matter, however, is that the older authors paid no very particular attention, either to exact localities of their specimens or to minute subspecific differences, and Koh Si Chang is certainly near enough to Siam to be quoted as such by Horsfield. The conception also, of a definite specimen as a type of a species when one or more were available is of very much later date than Horsfield in 1824 or for the matter of that than Dr. Anderson, writing in 1878.

"We come, therefore, to the first detailed revision of the group on modern lines, that of Wroughton (*Ann. & Mag. Nat. Hist.* (8) ii, pp. 393 et seq., 1908). This paper has been quoted by Mr. Kloss but he has unfortunately omitted to note that therein the specimen from Koh Si Chang has been definitely selected as the type, as indeed had already been done by Bonhote in 1900. The dimensions given by Wroughton perfectly agree with those of the type of *Sc. f. portus*, Kloss.

"Under the rules governing nomenclature, as almost universally



recognised by zoologists, the first reviser has the right to designate the type of a species from the original material, if such has not been done by the author of the species.

"*Sciurus finlaysoni portus* therefore becomes a pure synonym of *Callosciurus finlaysoni finlaysoni* (Raffles)."

As this is a good instance of the questions that crop up regarding zoological nomenclature owing to the lack of precision of the older authors, I propose to deal with it in some detail. On p. 157 of the first volume of this journal I wrote:—

"Koh Si Chang has been regarded of late as the type locality of *Sciurus finlaysoni*, but in looking through the history of that name it becomes evident that this is a mistaken view, and that it applies to the white squirrel of the Siamese mainland.

"*Sciurus finlaysoni* was described by Horsfield in 1824 (*Zoological Researches in Java*), from specimens collected by Dr. George Finlayson, the naturalist who accompanied Crawford in his mission to Siam and Cambodia. It is evident that Horsfield, when erecting the species, had in mind the mainland animal, for he says that it is Buffon's "*Ecuriel blanc de Siam*" which was seen at Loupeen, a village situated in the extensive forests of Siam, by P. Tachard in his travels. The account of the species closes with an extract from Finlayson's manuscript, describing the white squirrel which ends "one of the specimens was shot by Lieut. Rutherford on the Islands called Sichang in the Gulf of Siam." It is once more obvious that Finlayson, too, was dealing with the mainland animal, and that this reference to the island example was merely a detail as to extent of range.

"Further, Horsfield, in the *Catalogue of the Mammalia in the Museum of the East India Company, 1851*, again gives the locality of a specimen of *S. finlaysoni* as Siam, while Anderson who personally studied all the types of what he regarded as varieties of *Sciurus ferrugineus* states (*Zoological Research in Yunnan*, p. 244) that "the type of *S. finlaysoni* was obtained in Siam by Dr. Finlayson and another was procured by the same traveller in Sichang Id."

My contention was that Horsfield was dealing with the animal of the mainland, for he gave as a synonym Buffon's "*Ecuriel blanc de Siam*" and says early in his account that the species had hitherto been mentioned by Buffon alone who knew of it from the interior of Siam.

It is evident from his M. S. that Finlayson collected more than one specimen of white squirrel, only one of which came from Koh Si Chang however, and we now know that a white form does not occur on any other island of the Inner Gulf; so since Koh Si Chang is placed in opposition to some other place the rest of his material must have come from the continent. It appears to me quite clear from his references to Buffon that it was this latter material that Horsfield had in view when describing the species, so that the mainland, mentioned first by him, must be regarded as the locality. In fact he is precise, he says in effect:—*Sciurus finlaysoni* is Buffon's "*Ecuriel blanc de Siam*."



With regard to Horsfield's "Catalogue", Mr. Robinson is quite correct in stating that the habitat of the species *Sc. finlaysoni* is given as Siam, and that a specimen "A" is there recorded. But as Horsfield was well aware that a white squirrel had been obtained by Finlayson on Koh Si Chang, and yet makes no reference to that place, it may naturally be inferred that specimen "A" was not the island animal. However that may be, he says that the species occurs in Siam; not on Koh Si Chang.

The provenance of *Sc. finlaysoni* seems to be left in no doubt, but when uncertainty exists, as is so often the case in the writings of the older authors, the first reviser has the right to designate a type-specimen as Mr. Robinson says. He has, however, equally the right to indicate a type-locality.

Though I do not consider it necessary in this case to call in the assistance of a reviser, the first is unquestionably Dr. John Anderson, in whose "Zoological Researches in Yunnan" published in 1878 there are reviewed under "*Sciurus ferrugineus*" a number of squirrels which he considered to be only varieties of that species. Fortunately as regards *Sc. finlaysoni* he is very explicit. He writes:—"I have personally studied the types of all these supposed species. The type of *S. finlaysoni* was obtained in Siam by Dr. Finlayson, and another was procured by the same traveller in Sichang Island off the coast of Siam."

That Anderson regarded various examples from the mainland and that from the island as exactly alike, is no matter in so far as the present question is concerned, nor is the manner in which he studied the specimens. His remark evidently applies to colour and not to size, since the species *Sc. bogarti*, also considerably smaller than *Sc. ferrugineus* is also regarded by him as merely a colour variety of the larger animal. At that date the poor appearance of the skins veiled differences in size, and less importance was attached to dimensions than to-day; measurements of specimens in the flesh were generally not recorded, and as the skulls were frequently left within the skins they were often ignored for purposes of comparison.

If, as Mr. Robinson says, the date of the conception of a definite specimen as a type is more recent than Anderson's time, the latter seems to have unconsciously anticipated the principle in this instance.

Regarding the point as settled and Anderson as the first reviser, there was no need for me to bring into discussion the later papers of Messrs. Bonhote and Wroughton. As a matter of fact, however, it cannot be said that a "specimen from Koh Si Chang has been definitely selected as the type" by the former: Wroughton says that "the type-locality is the island of Sichang" and gives dimensions of a "type" which, however, he does not cite: but this is not quite the same thing. Bonhote again (P. Z. S., 1901; not 1900, where he only records a number of squirrels from the more northern parts of Siam as *Sc. finlaysoni*) did not select a type as stated by Mr. Robinson: he gives measurements of the "type of *S. finlaysoni*" (which differ somewhat



from those of Wroughton) but neither indicates the specimen, nor even its provenance.

I was of course aware (Journal, p. 159, para. 2) that these authors both probably regarded the type locality as insular, and my note was written with the object of showing that this was a mistaken view.

Mr. Wroughton's paper is subsequent to the "Zoological Researches" and the only way in which Anderson's statement could be discounted, even though the type he saw may have disappeared—as has happened more than once—would be to prove that a white squirrel does not occur in Siam. It is, however, very common there, and any attempt to select a lectotype is invalid unless an example, from the Siamese mainland of Horsfield's original series is available.

*C. f. tachardi* Robinson, is thus a synonym of *Sc. f. finlaysoni* Horsfield, and the name of the Koh Si Chang race remains *Sc. f. portus*.



## PROCEEDINGS OF THE SOCIETY.

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### 3rd ANNUAL GENERAL MEETING

Held at the office of the Bangkok Times on the 29th February, 1916. There were present 17 members and 5 guests.

In making his report and presenting the accounts for the year, the Vice-President, Dr. Malcolm Smith, remarked that notwithstanding the war the interest in the Society was well maintained, and the number of members at the end of the year was 73, approximately the same as last year.

The accounts, showing a credit balance of Tcs. 577.08 were passed, and the voting for the officers for 1916 resulted as follows:—President, Mr. Williamson; Vice-President, Dr. Malcolm Smith; Hon. Secretary and Treasurer, Mr. Cole; and a committee composed of the above named three members and Messrs. Godfrey and Webb.

On the proposal of Mr. Godfrey, seconded by Mr. Nunn, Messrs. Williamson and Smith were re-elected Editors of the Journal.

An Ordinary General Meeting then took place, and specimens were exhibited by H. R. H. the Prince of Chumpon, Mr. Godfrey, Mr. Herbert, Mr. Williamson, Dr. Malcolm Smith and Mr. Duke.

### 2nd ORDINARY GENERAL MEETING, 1916.

This was held at the office of the Bangkok Times on the 16th August, 1916. There were present 8 members and one guest.

H. R. H. the Prince of Chumpon exhibited a collection of some 50 different kind of fungi from various parts of Siam, including coloured sketches of many of these shewing their appearance during life. Mr. Godfrey exhibited butterflies, and shewed some remarkable examples of mimetic and protective colouring. Dr. Smith and Mr. Williamson also exhibited specimens.

### 3rd ORDINARY GENERAL MEETING, 1916.

Held at the office of the Bangkok Times on the 20th November. 15 members and 5 guests being present. An exhibition was given by Mr. C. Boden Kloss of specimens of mammals and birds recently obtained by him at Lat Bua Kao near Korat, Koh Lak, and on the islands of Koh Lan and Koh Kram.







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THE  
JOURNAL  
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Natural History Society of Siam

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Volume II.

BANGKOK.

Number 3.

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ERRATUM.

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Page 247 line 19, for "natural grey" read "neutral grey."

during a short expedition in which, as explained by the author and the collector in the introduction to the Paper, the collection of birds was only a secondary object—the principal purpose of Mr. Kloss' visit being the investigation of the island races of mammals. Nevertheless, some interesting specimens were procured. The latter Paper deals with the 353 species obtained or observed during Count Gyldenstolpe's two lengthy visits to Siam, and is the most important account of any collection of Siamese birds which has yet been published.

In the introductory remarks to the first part of the present Paper it was stated that the classification and nomenclature of the species to be described would be those adopted in the *Fauna of British India—Birds*, by Oates and Blanford, and that the numbers in brackets, preceding the names of the birds, would be those given in that work.







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THE BIRDS OF BANGKOK.

By W. J. F. WILLIAMSON, M.B.O.U.

(Continued from Vol. I, No. 3, p. 210.)

Since the last instalment of this Paper appeared, two important contributions to the ornithology of Siam have been published, *viz.*, those of Mr. H. C. Robinson, M.B.O.U., C.M.Z.S., "On Birds collected by Mr. C. Boden Kloss, F.R.G.S., M.B.O.U., on the Coast and Islands of South-Eastern Siam," which appeared in the *Ibis* for October 1915, pp. 718-761, and Count Nils Gyldenstolpe's "Zoological Results of the Swedish Zoological Expeditions to Siam, 1911-12 and 1914-15. Part IV. Birds II," published in the *Kungl. Svenska Vetenskapsakademiens Handlingar*, Band 56, No. 2, 1916. The former records 100 species obtained during a short expedition in which, as explained by the author and the collector in the introduction to the Paper, the collection of birds was only a secondary object—the principal purpose of Mr. Kloss' visit being the investigation of the island races of mammals. Nevertheless, some interesting specimens were procured. The latter Paper deals with the 353 species obtained or observed during Count Gyldenstolpe's two lengthy visits to Siam, and is the most important account of any collection of Siamese birds which has yet been published.

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Further, that species not included in the *Preliminary List of the Birds of Bangkok* (*vide* Vol. I, No. I of this *Journal*, pp. 41-48), would be marked with an asterisk (\*). For the sake of uniformity this arrangement will be continued, but as, in the interval, the employment of the trinomial system of nomenclature has made considerable progress, and as a number of the birds still to be dealt with in this Paper have been accorded subspecific rank in recent contributions to the ornithology of Siam, a brief synonymy will hereafter be given in the case of every bird recorded by other collectors. For the sake of brevity, Count Gyldenstolpe's two Papers published in the *Kungl. Svenska Vetenskaps akademis Handlingar*, Band 50, No. 8, 1913, and Band 56, No. 2, 1916, will be quoted as "Gyldenstolpe 1913" and "Gyldenstolpe 1916," respectively.

Family *TURDIDÆ*—Chats, Robins, Thrushes, &c.

40 (610). *Pratincola maura* (Pall.) *The Indian Bush-Chat.*

*Pratincola torquata stejnegeri*, Gyldenstolpe 1913, p. 30; *id.* 1916, p. 51.

*Description.* Length about 127 mm. (5 in.). *Male.* Head and neck all round black; back also black, but with (in winter plumage) rufous margins to the feathers, giving a mottled appearance, which, however, disappears as the season advances and the rufous edges get worn; rump and upper tail-coverts white, sometimes suffused with rufous; wing dark brown, with a white patch caused by the innermost wing-coverts—the quills being edged with rufous on the outer webs and tips; tail blackish brown to black; a large white patch on the side of the neck; breast orange-rufous; remainder of lower plumage paler rufous. *Female.* Whole upper plumage brown (with rufous margins to the feathers), except the upper tail-coverts which are pale rufous; no white patch on the side of the neck; wings and tail as in the male; chin and throat pale fulvous; remainder of lower plumage orange-fulvous.

Iris dark brown. Bill, legs, feet and claws blackish brown to black.

*Habits, &c.* This is a cold weather visitor to Bangkok, and occurs here, so far as my observations go, from October to April. It



is to be found in the more open parts of the suburbs and in the surrounding fields, and has a habit of perching on the top of any convenient stalk or tuft of grass, low bush or fence. My experience is that it is a wary little bird, and difficult to approach. Like all Chats, it feeds entirely on insects, which it takes on the ground, and then returns immediately to its post of observation.

*Distribution.* This bird is probably to be found in suitable localities, in the cold weather, throughout the country. Besides Bangkok, where it is fairly common, it has been obtained by Gyldenstolpe from Eastern, Northern and Peninsular Siam.

41 (650). *Calliope camtschatkensis* (Gmel.) *The Common Ruby-throat.*

*Description.* Length about 152 mm. (6 in.). *Male.* Whole upper plumage olive-brown, the head slightly darker; a line from the forehead over the eye white; lores and partly under the eye black; a broad moustachial streak white; throat and foreneck scarlet—the scarlet patch, in the case of fully adult birds, being bordered by black; upper breast greyish brown, paler on the lower breast and the sides of the body; abdomen and under tail-coverts whitish. *Female.* Differs from the male chiefly in having the lores dusky brown instead of black: the moustachial streak olive-brown and not white; and the throat and foreneck whitish instead of scarlet.

Iris dark brown. Bill dark horn-colour, except the gape and the base of the lower mandible, which are dull whitish. Mouth dusky flesh-colour. Legs and feet dusky flesh-colour, paler on the hinder portion of the tarsus and on the soles. Claws horn-colour.

*Habits, &c.* A cold weather visitor, of which I have obtained a few specimens in the months of January to March. The bird is a great skulker and keeps to the ground in the cover of thick bushes and undergrowth, so is difficult both to observe and obtain. It is, I believe, entirely insectivorous. The brilliant red throat of the males is a most distinctive and attractive feature of the colouration of this bird, but owing to its retiring habits it is, unfortunately, never seen unless carefully sought for in its haunts.

*Distribution.* I recorded this species in 1914 (*Journ. N. H. S. Siam* I, p. 44) and have obtained a specimen or two every year since



then, but it does not appear to have been procured or observed by any other collector in Siam, and I myself have not met with it outside Bangkok. The bird must, of course, occur in other parts of the country also, in the cold weather, but it escapes observation owing to its skulking disposition.

42 (663). *Copsychus saularis* (Linn.). *The Magpie-Robin*.

*Copsychus saularis*, Gyldenstolpe 1913, p. 39 : Gairdner, Journ. N. H. S. Siam I, p. 149.

*Copsychus saularis saularis*, Gyldenstolpe 1916, p. 50.

Siamese, นก King-khen (Nok king-khen).

*Description.* Length about 203 mm. (8 in.). *Male.* Head, neck, breast and upper plumage glossy black; abdomen, sides of body and under tail-coverts white; wing brownish black—the last two secondaries with a considerable amount of white on the outer webs, and the wing-coverts also largely white; median two pairs of tail feathers black, the next pair with the base and a variable amount of the inner (and sometimes also the outer) web black—the remaining pairs with a decreasing amount of black, the outermost pair usually having only a trace of that colour on the extreme base of the feathers\*; under wing-coverts and axillaries usually white, with ashy bases and centres varying in extent, but in some specimens the central and basal portions of the feathers are almost black. *Female.* Whole upper plumage dark brown, glossed with bluish; wings and tail dark brown, with white distributed as in the male; chin, throat, breast and sides of neck dark grey; middle of abdomen whitish; remainder of abdomen, sides of body and under tail-coverts pale fulvous; under wing-coverts and axillaries as in the male.

Iris brown. Bill black. Legs dark plumbeous. Claws horn colour.

*Habits, &c.* This is the familiar black and white bird, which is a permanent resident here and to be found in every Bangkok garden. It is a good songster and also has some fine whistling notes, its song being usually uttered from the topmost twig of a tree, the ridge of a roof or other elevated point of vantage, and it is particularly vocal

\* The colouration of the tail-feathers, here given, is described from a dozen Bangkok specimens in my possession. It differs, in several particulars, from the description to be found in the *Fauna of British India*, Birds II, p. 117.



towards evening. The Magpie-Robin is also one of the first birds to commence calling in the morning, and I have, on many occasions, heard it utter a few notes well on in the night. For the rest, it spends much of its time on the ground, where it feeds on insects, and has a habit of taking a short run, every now and then, at the end of which, as well as when alighting on a perch, it elevates its tail perpendicularly.

*Distribution.* To be found throughout the country in, and near, towns, villages and human habitations. I have not met with the bird in heavy forest—its natural habitat being light jungle or garden land. It would thus be absent also from treeless plains.

43 (692). ***Petrophila solitaria*** (P.L.S. Müll.). *The Eastern Blue Rock-Thrush.*

*Petrophila solitaria*, Robinson and Kloss, *Ibis* 1911, p. 64.

*Monticola solitarius philippensis*, Gyldenstolpe, *Journ. N. H. S. Siam* 1, p. 170; Robinson, *Ibis* 1915, p. 752, Gyldenstolpe 1916, p. 48.

*Description.* Length about 241 mm. (9.5 in.). *Adult male.* Whole upper plumage, with neck and breast, dull blue, paler on the throat, lower back and upper tail-coverts—most of the feathers being tipped whitish and with a subterminal black bar; quills and tail blackish, edged with bluish and with each feather very narrowly tipped whitish; vent, under tail-coverts, axillaries and under wing-coverts chestnut, the same colour sometimes extending to the abdomen. *Female and immature male.* Whole upper plumage very dull blue, most of the feathers being edged whitish and with a black subterminal bar, as in the adult male; quills and tail dark brown, edged with dull bluish and tipped whitish; whole lower plumage and the sides of the head and neck pale buffy white, each feather subterminally edged with black; under wing-coverts, axillaries and under tail-coverts suffused with rufous and irregularly barred with black. In the immature male the abdomen is also sometimes more or less rufous.

In both sexes the whitish tips and subterminal bars to the feathers become abraded towards the end of winter, and the plumage becomes more uniform in appearance. Further, according to Oates (*Fauna, British India*, Birds II, p. 146), the amount of chestnut on the lower parts varies, being generally present on the under tail-coverts, and only in a few cases extending to the abdomen (? and under wing-coverts) in varying quantities. He adds that birds in typical



plumage (*i.e.*, with the abdomen fully chestnut) are only found in Japan and the islands of the China seas. In the two specimens I have obtained, one (an apparently fully adult male, from Sriracha, South-eastern Siam) has rufous only on the vent and under tail-coverts, while in the other (a younger male, from Bangkok), the vent, under tail-coverts and under wing-coverts and axillaries are bright chestnut, and traces of that colour extend up the abdomen. Oates further states that the cause of this variation is not known, but may be attributed either to climatic reasons or to the interbreeding of this and the next species, *Petrophila cyanus*.

*Habits, &c.* This is a cold weather visitor to Siam, from Japan and Northern China. It is fond of perching on the roofs of houses and on posts in gardens, and I have seen a Blue Rock-Thrush, either of this or the next species, on the rocks near the sea at Koh Lak, in Peninsular Siam. The bird is usually found solitary, and not only do its habits make it easy to observe, but my experience is that it has little fear of man.

*Distribution.* Recorded from Northern, Central, Southern-eastern and Peninsular Siam. Judging by the number of specimens obtained in the several divisions of the country, as noted in the Papers quoted in the synonymy, it appears to be commonest in South-eastern Siam, and to be rather rare elsewhere. This is certainly the case in Bangkok, where I have only obtained this bird once, in January.

44 (693). *Petrophila cyanus* (Linn.). *The Western Blue Rock-Thrush.*

*Monticola cyanea*, Gyldenstolpe, Journ. N. S. H. Siam I, p. 170; id. 1916, p. 47.

*Description.* Length about 241 mm. (9.5 in.). In both sexes the colouration is very similar to that of *P. solitaria*, described above, but without any trace of chestnut or rufous on the under parts.

*Habits, &c.* Precisely similar to those of the preceding species, than which, however, it is much commoner, though not by any means plentiful. I have obtained altogether five specimens here, during the months of January and February, and one at the beginning of April, besides a few more in other parts of the country, from October to February.

*Distribution.* Recorded, up to the present, only from Northern,



Central and Peninsular Siam, but I have also procured it at Sriracha, in South-eastern Siam.

Family *POCEIDÆ*—Weaver-birds and Munias.

45 (721). *Ploceus megarhynchus*, Hume. *The Eastern Baya or Weaver-bird*.

*Ploceus megarhynchus*, Gairdner, Journ. N. H. S. Siam I, p. 149.

*Ploceus passerinus infortunatus*, Gyldenstolpe 1916, p. 28.

Siamese, นกกระยาบ หัวเหลือง (Nok kra-chab hua-liang).

*Description.* Length about 152 mm. (6 in.). *Male in winter, and female at all seasons.* Upper plumage fulvous streaked with brown, narrowly on the head and neck, more broadly on the back—the streaks becoming obsolete on the rump and upper tail-coverts; quills and tail dark brown, each feather edged with fulvous, the edges of the primaries and tail-feathers being also tinged with greenish; sides of the head fulvous brown; whole lower plumage fulvous, darker on the breast and flanks. *Male in summer.* Forehead, crown and nape bright yellow; sides of head, as well as chin and throat dark brown; breast tawny, paling to fulvous or albescent on the abdomen.

Iris brown. Bill; male, in winter, and female, at all seasons, brownish horn-colour, except base of lower mandible which is yellowish; male, in summer, black. Legs pale flesh-colour. Claws pale pinkish horn-colour.

*Habits, etc.* The Weaver-birds are highly gregarious, breeding in company in the summer, and being found in large flocks at other seasons. In Bangkok this bird is chiefly in evidence from April (when the male assumes its yellow crown) to nearly the end of the rains, as it is then busily engaged in building operations, and its long, hanging nests, usually suspended from the tips of branches, over water, are familiar to most residents in this city. While the nest-building is going on (and there appear to be a succession of broods during the breeding season) the birds keep up a constant chatter, and as the nests are nearly always in colonies, the volume of sound is sometimes considerable. These birds are quite fearless, and seem to be almost oblivious of the presence of man—a group of nests being often seen on a tree of no particular size within a few feet of a house.



I do not know whether this bird (and the remark also applies to the next species) remains in the neighbourhood of Bangkok during the winter. Personally, I have not met with it earlier in that season than February.

*Distribution.* Up the present only recorded from Northern, Central and Western Siam. Gyldenstolpe remarks (*op. cit. supra*, p. 29) that the Eastern Baya is "apparently rather rare" in Siam, but this is certainly not the case as regards Bangkok. During the summer (April to September) it is one of the commonest birds to be found in places suitable for its breeding, and I have had dozens of specimens, besides numerous nests and clutches of eggs. I have also found the bird breeding in some numbers at Ayuthia (about 45 miles north of Bangkok) in July, and Mr. K. G. Gairdner obtained three last year, which were shot in February at Raheng (in the northern part of Central Siam), out of a flock of from 100-200 individuals, feeding in long grass on the river bank.

46 (723). *Ploceus manyar* (Horsf.). *The Striated Weaver-bird.*

*Ploceus manyar flaviceps*, Gyldenstolpe 1916, p. 29.

Siamese, นกกระจามหัวเห็ดขิง ออกลาย (Nok kra-chab hua-lüang ok-lai).

*Description.* Length about 140 mm. (5.5 in.). *Male in winter, and female at all seasons.* Upper plumage dark brown, each feather being edged with fulvous, giving a streaked appearance; quills and tail-feathers dark brown, the former edged with greenish yellow, the latter with pale yellowish; supercilium and a narrow patch behind the ear-coverts yellow; cheeks brown; lower plumage fulvous, pale on the chin, throat and abdomen—the feathers of the breast and flanks being streaked with dark brown down the centre of each feather.\* *Male in summer.* Forehead, crown and nape bright yellow; no yellow supercilium, or patch behind the ear-coverts; sides of head, as well as cheeks, chin and throat blackish brown.

Iris brown. Upper mandible; male, in winter, and female, at

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\* The description above given, which is taken from birds obtained in Bangkok, differs, to some extent, from that in the *Fauna of British India*, Birds II, p. 179.



all seasons, horn-colour : lower mandible yellowish ; whole bill of male, in summer, dark horn-colour, except base of lower mandible which is paler. Legs pinkish to dusky flesh-colour ; claws horn-colour.

*Habits, &c.* Very similar to those of the last species, except that the nests are built in high grass, as well as on trees. In both cases a situation in close proximity to water appears to be almost invariably selected, and when placed in grass the nests are suspended from the extremities of a number of blades drawn together. Compared with those of *P. megarhynchos*, the nests of this species are very short, being only about 228 mm. (8 in.) in total length, against as much as 838 mm. (33 in.), for the former : they are, therefore, much less conspicuous, even when placed in trees, which is, I think, the exception.

\* 47 (726). ***Munia atricapilla*** (Vieill.). *The Chestnut-bellied Munia.*

*Munia atricapilla rubromigra*, Gyldenstolpe 1916, p. 27.

*Description.* Length about 114 mm. (4.5 in.). Whole head, neck and upper breast black ; remainder of plumage chestnut, brighter and deeper on the rump and upper tail-coverts, and inclined to blackish on the middle of the abdomen and the under tail-coverts.

Iris dark brown. Bill leaden blue. Legs dark plumbeous.

*Distribution.* So far, apart from Bangkok, in Central Siam, this bird has only been recorded from the Northern portion of the Kingdom, but I have obtained it from Bangnara, in the extreme south of the Peninsular division of this country. As to its occurrence in Bangkok, it may be noted that in 1915 I added this bird to the list of local species (*Journ. N. H. S. Siam* I, p. 198), on the strength of information furnished by Mr. E. G. Herbert, who stated that he had seen it more than once in his compound on the west side of the river, and had shot it on Klong Dakhanong, a little further south. The fact may also be mentioned that Flower (*Ibis* 1898, p. 323) has recorded that he once saw a bird in his garden in Bangkok, which he believes was of this species. As, however, the Chestnut-bellied Munia is common in the bird-shops here, it is possible that the specimens observed at large may have been escapes from captivity. Personally, I have not come across the bird, nor have my collectors obtained it, in this locality.



18 (727). **Uroloncha acuticauda** (Hodgs.). *Hodgson's Munia*.

*Munia acuticauda*, Ogilvie-Grant, Fasc. Malay. Birds (1905), p. 69 ;  
Robinson, Journ. F. M. S. Mus. V. (1915), p. 151.  
*Uroloncha acuticauda*, Gyldenstolpe 1913, p. 40.

Siamese, นกกระโทก (Nok kra-thi).

*Description.* Length about 114 mm. (4.5 in.). Whole upper plumage dark brown, with a band of white across the rump, and with the edges of the upper tail-coverts pale—the shafts of all the feathers of the upper plumage being white ; wings, the feathers round the bill, and the chin, throat and upper breast blackish brown ; remainder of the breast dark brown, with pale margins and white shafts to the feathers ; abdomen and sides of the body whitish, mottled with brown ; thighs and under tail-coverts chocolate-brown, with white shafts.

Iris reddish brown to dull red (dark brown—Oates). Upper mandible blackish, lower mandible bluish plumbeous. Legs dark plumbeous. Claws dusky horn-colour.

*Habits, etc.* This is a resident bird, and is not uncommon. It appears to breed from January to August or September, as I have seen nests, or taken eggs, at intervals, during those months. The nest is a large one, for the size of the bird, and is an untidy, domed structure, made of dried grass-stems, with a hole at the side, and is placed either in the fork of a tree, at no great height from the ground, or in creepers, &c., against the side of a house. When not breeding, this *Munia* assembles in small flocks. Its note is a rather short *chr-chr*.

*Distribution.* Northern, Central and Peninsular Siam. Not yet recorded from the Western or South-eastern parts of the country.

19 (735). **Uroloncha punctulata** (Linn.). *The Spotted Munia*.

*Munia punctulata subundulata*, Gyldenstolpe 1916, p. 28.

Siamese, นกกระชาบ<sup>๕</sup>ขี้หมู (Nok kra-chab khi-mu).

*Description.* Length 123 mm. (4.8 in.). Upper plumage dull chocolate-brown, with the shafts of the feathers whitish ; lower rump purer and with whitish edges to the feathers ; tail brown ; wings



chocolate-brown, the outer webs dull rufous; sides of the head, chin and throat rich chestnut; lower plumage brown (each feather with a white centre-line and submarginally bordered with white), except the middle of the lower portion of the abdomen, which is uniform fulvous-white; under tail-coverts fulvous-white, with brown subterminal borders to the feathers.

Iris reddish brown. Bill blackish, except the base of the lower mandible, which is bluish plumbeous. Legs plumbeous. Claws horn-colour.

*Habits, etc.* Very similar to those of the last species, but it is much the commoner of the two. The bird is a resident one here, and when it once becomes established in a locality, is seldom absent from it. In my garden, for instance, it is nearly always to be found, but I believe there are parts of Bangkok (to all appearances equally suitable) where the bird is seldom or never seen. It breeds practically the whole year round. The nest is of the same type as that of *U. acuticauda*, but perhaps somewhat larger, and the bird is even more partial to creepers on houses and arbours than its congener. Its note is a weak and rather long *chee-chee*, uttered both while flying and when at rest. In flight the wings are vibrated very rapidly.

*Distribution.* Recorded, so far, only from Central and Peninsular Siam, but I have also obtained it at Sriracha, in the South-eastern portion of the country.

### Family FRINGILLIDÆ--Finches.

59 (779). *Passer montanus* (Linn.) *The Tree-Sparrow.*

*Passer montanus*, Ogilvie-Grant, Fasc. Malay. Birds (1905), p. 70; Barton, Journ. N. H. S. Siam I, p. 106.

*Passer montanus malaccensis*, Gyldenstolpe 1913, p. 41; id. 1916, p. 29.

Siamese, นกกระจอกบ้าน (Nok kra-chok ban).

*Description.* Length about 140 mm. (5.5 in.). Upper part of head, from forehead to nape, vinous chestnut; sides of face and neck white, with the exception of the lores, the feathers under the eyes and a patch under the ear-coverts, which are black; chin and throat black; lower plumage ashy, paler on the abdomen, and tinged with fulvous on the breast; flanks, thighs and under tail-coverts brownish fulvous; back and scapulars pale chestnut, with the inner webs of most of the



feathers largely black; lesser wing-coverts dull chestnut; median coverts black, edged with white; greater coverts blackish, edged with pale chestnut and tipped with whitish; quills dark brown, edged with rufous, narrowly on the primaries and more broadly on the inner feathers; rump and upper tail-coverts pale chestnut-brown; tail brown, edged with pale rufous.

Iris brown. Bill black. Legs flesh-colour. Claws horn-colour.

*Distribution.* Recorded by Ogilvie-Grant and Gyldenstolpe from Peninsular Siam and by the latter also from the Eastern and Central divisions. So far, the bird does not appear to have been definitely reported from Northern or South-eastern Siam\*, but I have observed it at Sriracha, in the last mentioned part of the country.

*Habits, &c.* The so-called Tree-Sparrow is the common House-Sparrow of Bangkok, where it is exceedingly abundant. This bird has a wide range over Europe, Africa and Asia, and its trivial name of Tree-Sparrow is probably accounted for by the fact that in Europe it usually nests in trees, whereas in the East it generally builds in holes about houses and other buildings. This it certainly does in Bangkok.

51 (781). *Passer flaveolus* Blyth. *The Pegu Sparrow.*  
*Passer flaveolus*, Gyldenstolpe 1916, p. 29.

Siamese, นกกระเจ๊กป่า (Nok kra-chok pa).

*Description.* Length up to 152 mm. (6 in.). *Male.* The lores, chin and a broad stripe down the throat black; cheeks, centre of abdomen, under tail-coverts and under wing-coverts yellow; breast and flanks greenish grey; a patch extending from the eye to the sides of the nape chestnut; forehead, top of head, nape, and hind neck dark greenish grey; back, scapulars and lesser wing-coverts chestnut—the feathers fringed with greenish grey; lower back and rump greenish grey, slightly darker than the flanks; tail brown, edged with dull greenish grey; wing-feathers dark brown, edged with greenish. *Female.* The chin, throat, cheeks, a streak from the eye to the nape,

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\* Gyldenstolpe certainly observes (*op. cit. supra* 1913, p. 41) that this Sparrow is "very common.....over the whole country," but in the separate lists of species recorded from the different parts visited (given on pages 7-12 of the Paper), it only appears in those relating to Eastern and Central Siam.



and the whole lower plumage, with the under wing-coverts, pale yellow, suffused with dusky on the breast and flanks; the whole upper plumage hair-brown; median wing-coverts dark brown, edged with yellowish; greater wing-coverts and quills dark brown, edged with greenish brown; tail brown, narrowly edged paler.\*

Iris brown. Bill black in adult male, horn-colour in female and immature male. Legs dusky olive to plumbeous flesh-colour. Claws horn-colour.

*Distribution.* With the exception of my Bangkok record, this bird has apparently only been reported, up to the present, from Northern Siam. Gyldenstolpe remarks that it is "apparently very rare and only confined to the Northern parts of the country. However, Williamson records it from Bangkok, which seems to me a little doubtful." As to this I would observe that the bird is fairly common here, and that I have had altogether about 18 local specimens, and could have obtained many more. I have also seen it at Muak-lek, in Eastern Siam, and shot a pair (♂ and ♀) at Sriracha, in South-eastern Siam, in December. The only parts of the country from which it has not yet been reported are, therefore, the Western and Peninsular divisions, and these may be outside its range, as I have not been able to find any records of its occurrence in Tenasserim or the Malay Peninsula. As this Sparrow is known to extend to Cochin-China (*Faun. Brit. India*, Birds II, p. 242), its occurrence in Bangkok and in South-eastern Siam appears quite natural.

*Habits, &c.* In common with the last species, this is a resident here, but is not so familiar a bird, being not only less numerous, but also more partial to plantations and copses, rather than houses. At the same time, it not infrequently enters our gardens, and I have on two occasions found it nesting there—once, in Bangkok, in a hollow bamboo used for the scaffolding of a house under repair, and a second time under the ridge of the roof of a building in the compound of the railway station at Muak-lek, in Eastern Siam. I have generally observed this bird in pairs, and it is easily distinguished from its better-known congener by its brighter plumage, as well as by its louder and more pleasing notes.

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\* The descriptions here given differ to some extent from those of Oates in the *Fauna of British India*, Birds II, p. 242.



\*52 (797). *Emberiza aureola*, Pall. *The Yellow-breasted Bunting*.

*Emberiza aureola*, Ogilvie-Grant, Fasc. Malay. Birds (1905), p. 70 ;  
 Gyldenstolpe, Journ. N. H. S. Siam 1, p. 171 ; id. 1916, p. 30.

*Description*. Length 157 mm. (6.2 in.). *Male in winter*. The whole upper plumage dull chestnut, each feather margined with ashy ; tail brown, edged ashy, the outermost feathers with a broad diagonal white band across the inner web, the penultimate with a similar but narrower band † ; median wing-coverts white ; greater coverts dark brown, edged with chestnut-brown and tipped whitish ; quills dark brown, the primaries narrowly edged paler, and the inner wing-feathers broadly margined with pale chestnut-brown ; the sides of the head dull yellow mingled with chestnut-brown ; the whole lower plumage yellow, with a chestnut band across the breast, and the sides of the body streaked with chestnut-brown—the under tail-coverts being very pale whitish yellow. *Male in summer*. In the spring the ashy margins of the feathers of the upper plumage become abraded and the general colour becomes a rich maroon-chestnut ; the pectoral band also becomes broader and of a deeper chestnut, while the forehead, anterior part of the crown, lores, ear-coverts, cheeks, chin and a small part of the throat become deep black. *Female*. Head chestnut-brown, with dark brown streaks ; nape and back of neck olive-brown, with indistinct brown streaks ; back olive-brown with broad dark brown streaks ; rump pale chestnut, edged with grey ; upper tail-coverts and tail brown, with white on the outer tail-feathers as in the male ; median and greater wing-coverts dark brown, edged with whitish ; quills brown—the primaries narrowly tipped and edged paler on the outer webs, and the remaining feathers more broadly edged with pale rufous-brown ; sides of head mixed brown and yellowish white ; chin and throat whitish ; breast and abdomen yellow, with an indistinct brown band across the breast ; under tail-coverts faint yellow. *Immature bird*. Very similar to the female, except that it has no chestnut tinge on the head and rump, and that the whole breast is streaked with brown.

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† The colouration of the tail feathers, here given, is based on adult specimens in my possession.



Iris rich brown. Upper mandible dark brown, lower fleshy horn-colour. Legs pinkish brown. Claws horn-colour.

*Distribution.* Northern, Central and Peninsular Siam. It has not yet been recorded from the other divisions of the country, but almost certainly occurs there in suitable localities, as it has an extensive range in Eastern Asia.

*Habits, &c.* This bird is a winter visitor to Siam, and, in common with other Buntings, is essentially a frequenter of fields, waste lands and grassy plains, as it feeds on grains and seeds of various kinds. In Bangkok it is confined to the open parts of the suburbs, and appears to be rather rare, as I have only come across it twice, in small flocks, in the month of April, *i.e.*, towards the end of its stay in this country. When disturbed in their feeding grounds, the birds immediately fly in a flock to a convenient neighbouring tree or bamboo-clump. Outside Bangkok I have obtained the bird from Klong Rangsit and Samkok, both being places a little north of this City. At Samkok it was common in February in bamboo-clumps near dry rice-fields.

#### Family HIRUNDINIDÆ—Swallows.

53 (814.) **Hirundo gutturalis** Scop. *The Eastern Swallow.*

*Hirundo gutturalis*, Ogilvie-Grant, Fasc. Malay. Birds (1905), p. 95.

*Chelidon rustica gutturalis*, Gyldenstolpe 1913, p. 41 : id, 1916, p. 83.

*Hirundo rustica gutturalis*, Robinson, Ibis 1915, p. 742.

Siamese, นก คี น้ น (Nok i-en).

*Description.* Length about 165 mm. (6.5 in.). Forehead, chin and throat chestnut ; lores black ; upper plumage glossy purplish blue ; quills and tail black suffused with purplish green, all the tail-feathers, except the middle pair, with a white patch on the inner web ; sides of the head and neck and a broad pectoral band black, but the chestnut of the throat encroaches on the pectoral band, and in many specimens nearly severs it down the middle of the breast ; lower plumage pale chestnut, becoming darker on the under tail-coverts.\* The outer pair

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\* This chestnut suffusion (which I have found in all the birds I have examined) is characteristic of *H. rustica* rather than of *H. gutturalis*, but in point of size, and in the encroachment of the chestnut of the throat on the black pectoral band, the birds found here resemble the latter species. They thus appear to be an intermediate form.



of tail-feathers extend beyond the others about 43 mm. (1.7 in.).\*

Iris dark brown. Bill black. Mouth yellowish. Legs blackish brown, soles paler.

*Distribution.* Recorded from all the divisions of the country, except the Northern and Western ones, but it must occur in them also.

*Habits, &c.* This bird is a seasonal visitor to Bangkok, and occurs in great numbers from August to about the middle of May, but one year I saw two on the 23rd July. It is thus absent from Bangkok for two or three months only. Gyldenstolpe remarks that the bird is "a winter visitor to Siam," but I think there can be no doubt that some, at least, of them remain to breed in this country. In 1916 I found the birds plentiful at Klong Rangsit, a few miles north of Bangkok, on the 29th May, and again observed a fair number on Koh Phai, an island in the inner Gulf of Siam, on 17th July.

The Eastern Swallow is one of our most familiar birds, and may nearly always be looked for either on the wing, hawking for the minute insects on which it feeds, or sitting in long rows on the electric light wires along the road sides. As a rule it flies fairly low, and is often to be seen skimming over the ground only a few feet above the surface. This it usually does over an open field, but I have frequently observed it flying in and out among the traffic, in the busiest thoroughfares of the City. I have only noticed the Swallow on the ground on one occasion, when a flock of them were disporting themselves on the road in front of the Wireless Station, and apparently picking up the grit from the surface.

#### Family MOTACILLIDÆ—*Wagtails and Pipits.*

54 (827). *Motacilla leucopsis* Gould. *The White-faced Wagtail.*

*Motacilla alba leucopsis*, Gyldenstolpe 1913 p. 41; id. 1916, p. 31.

*Description.* Length 197 mm. (7.75 in.). *Summer plumage.* The whole upper plumage, including the lesser wing-coverts, deep

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\* In one specimen, which I obtained on 9th November 1914, the bifurcation of the tail was about 68 mm. (2.7 in.), and the total length of the bird 210 mm. (8.2 in.)—measurements which approximate to those of *M. rustica*. I presented this bird to one of the Museums in Great Britain in 1915, and have, unfortunately, no note as to whether the black pectoral band was complete or not.



black, except the forehead and anterior portion of the crown, which, together with the sides of the head and neck, cheeks, chin and upper throat, are white; lower throat, fore neck and upper breast black; remainder of lower plumage white: median and greater wing-coverts white, except a small portion of the inner webs; quills black, with the basal portion of the inner webs, and the edges of the outer webs, white: the four middle pairs of tail-feathers black, narrowly margined with white on the outer webs—the remaining feathers being white, with a varying amount of black at the base and on the inner webs. *Winter plumage.* The whole back, rump and upper tail-coverts become grey; the lesser wing-coverts grey mixed with black: the lower throat and fore neck white instead of black, while the black on the upper breast is reduced to a crescentic patch.

Iris brown. Bill black, the base of the lower mandible with a bluish tinge. Legs very dark brown. Claws dark horn-colour.

*Distribution.* Appears to have been recorded only from Northern and Central Siam.

*Habits, &c.* A cold weather visitor to Siam. In Bangkok this species is evidently rare, as I have observed it two or three times only, and have obtained but a single specimen here. This was shot on the tiled roof of the stable in my compound, in January, while the bird was running about, *apparently* picking up insects. Outside Bangkok, I have obtained it at Samkok, 40 miles north, in a dry padi field on the 8th February, and it is of interest to note that this specimen was in full summer plumage. This fact appears to support Gyldenstolpe's remark (*op. cit.* 1913, p. 41) that the bird "seems to retire to its breeding places in Eastern Siberia and China rather early"—that is, as he explains further, by or before the middle of March.

This and the next species are only found in open country, and on the bare banks of rivers, &c.

55 (533). *Motacilla borealis* Sundev. *The Grey-headed Wagtail.*

*Motacilla borealis*, Ogilvie-Grant, Fasc. Malay. Birds (1905), p. 71; Robinson and Kloss, Ibis 1911, p. 73; Gyldenstolpe, Journ. N. H. S. Siam I, p. 171.

*Description.* Length about 178 mm. (7 in.). *Winter plumage.* The forehead, crown, nape and hind neck bluish grey; back and rump



dull olive-green; upper tail-coverts dark brown with olive-green edges; the four middle pairs of tail-feathers black, narrowly edged with pale olivaceous, the two outer pairs white, with a varying amount of dark brown on the inner webs; quills dark brown, margined with pale fulvous or greenish; lores, cheeks and ear-coverts dark slaty black; the whole lower plumage yellow, tinged with ochraceous across the breast, and with the dark bases of the feathers of that part showing through, giving a mottled appearance. *Male in summer plumage.* The forehead, crown, nape and hind neck dark slaty grey; back and rump yellowish green; margins of the wing-feathers pale greenish yellow; whole lower plumage bright yellow, with the dark bases of the feathers on the breast frequently showing through. *Female in summer plumage.* The upper green parts duller than in the winter; the crown and nape browner, with a greenish tinge; lores, cheeks and ear-coverts brown, not black; and a pale fulvous supercilium.

Young birds have the entire upper plumage brownish grey, tinged with bluish on the rump; upper tail coverts dark brown, edged with grey; margins of wing-feathers whitish; a white supercilium; lores and ear-coverts brown; lower plumage white, with a broad brownish gorget across the breast.

Iris dark brown. Bill dark brown, with base of lower mandible yellowish or greenish. Legs and claws dark brown, soles paler.

*Distribution.* Recorded, so far, only from Northern, Central and Peninsular Siam.

*Habits, &c.* This is also a cold weather visitor, but it is much commoner in Bangkok than the last species, and I have obtained specimens from November to May. It is to be found in the fields and market gardens round Bangkok, and appears to be partial to moist spots, or those in the vicinity of water.

56 (839). *Limonidromus indicus* (Gmel.). *The Forest-Wagtail.*

*Limonidromus indicus*, Robinson and Kloss, *Ibis* 1911, p. 73; Gyldenstolpe 1913, p. 42; id. 1916, p. 32.

*Description.* Length about 165 mm. (6.5 in.). Upper plumage dull olive-green—the upper tail-coverts blackish; a supercilium from the bill to the nape, the cheeks, chin, throat and all the lower plumage



pale yellowish white, with the exception of two black bands across the breast, the upper one entire, the lower one broken in the middle; greater and median wing-coverts black, with pale yellowish white tips, forming two bands across the coverts; quills brown, the second or third to the seventh primaries with a patch of yellowish white on the outer web near the base; all the primaries and secondaries with a margin of yellowish white on a portion of the outer web below the tip; middle pair of tail-feathers the same colour as the back; the next three pairs dark brown, very narrowly tipped with white; the two outer pairs all white, except at the base, where they are brownish.

Iris dark brown. Upper mandible dark brown, lower fleshy white. Legs pinkish flesh. Claws pale horn-colour.

*Distribution.* Up to the present only recorded from Northern, Central and Peninsular Siam, but I shot a specimen on a forest path near Sriracha, South-eastern Siam, in October 1914, and last year my collector obtained one at Lat Bua Khao, in Eastern Siam, in September. The only division of the country from which this bird has not yet been definitely reported is, therefore, the Western one, but it is certain to be found there also.

*Habits, &c.* This is also a winter visitor, and appears to be rather rare everywhere, though widely distributed. In Bangkok I have only obtained two specimens, both of which were shot in fruit gardens—one on the east side and the other on the west side of the river. The latter was on the ground when I first saw it, but on being disturbed it flew on to a low branch of a tree. Its note was rather a weak one of two syllables, *chu-chu*. The five specimens of which I have records were obtained between the middle of September and the middle of April.

57 (845). *Anthus richardi* Vieill. *Richard's Pipit*.  
*Anthus richardi striolatus*, Gyldenstolpe 1913, p. 42; id. 1916, p. 32.

*Description.* Length about 190 mm. (7.5 in.). Upper plumage fulvous-brown, the feathers centred with blackish, except on the rump, which is almost uniform; wing-feathers dark brown, margined with fulvous; outermost pair of tail-feathers almost entirely white, the penultimate pair brown, with a long oblique white streak on the inner web near the shaft—the outer web also being frequently white; the



remaining tail-feathers dark brown, with pale margins; supercilium and lower plumage pale fulvous, the sides of the throat and fore neck, and the whole breast, streaked with dark brown; flanks darker fulvous, with a few indistinct darkish streaks.

Iris dark brown. Upper mandible dark brown, lower pale horn-colour, dusky at tip and yellowish horn-colour at base. Mouth and gape yellowish. Legs pale flesh-colour, with pinkish or yellowish tinge, soles paler. Claws horn-colour.

*Distribution.* So far only recorded by Gyldenstolpe from Northern Siam, and by myself from the neighbourhood of Bangkok, in the Central division of the country.

*Habits, &c.* A winter visitor to Siam from Central and Northern Asia. I have obtained it in Bangkok from November to May, when it is common in the open fields round the City. I believe this Pipit is entirely a ground bird, where it feeds on insects by making rapid runs at them.

58 (847). *Anthus rufulus* Vieill. *The Indian Pipit.*

*Anthus rufulus*, Ogilvie-Grant, *Fasc. Malay. Birds* (1905), p. 71;

Gyldenstolpe, *Journ. N. H. S. Siam* I, p. 171.

*Anthus malayensis*, Robinson and Kloss, *Ibis* 1911, p. 74.

*Anthus richardi malayensis*, Gyldenstolpe 1916, p. 32.

Siamese, นกกระต๊าก (Nok-kra-tid.)

*Description.* Length about 165 mm. (6·5 in.). In colouration this bird exactly resembles the last species (*A. richardi*), of which it is a miniature, except that the bill is proportionately larger.

Iris dark brown. Upper mandible and tip of lower dark brown, remainder of lower mandible yellowish or pinkish flesh-colour. Legs pale yellowish flesh-colour. Claws horn-colour.

*Distribution.* Recorded, up to the present, only from Northern, Central and Peninsular Siam.

*Habits, &c.* A resident species, with habits precisely similar to those of *A. richardi*, just described, in whose company the bird is frequently found. This is not meant to imply that Pipits are in the least gregarious—I should rather describe them as solitary—but both these species occur in the same fields, feeding near each other. This Pipit is a regular frequenter of our lawns, except during the breeding season (March to July or August), when it keeps to the fields.



\*59 (849). *Anthus cervinus* (Pall.). *The Red-throated Pipit.*

*Anthus cervinus*, Williamson, Journ. N. H. S. Siam I, p. 198.

*Description.* Length about 159 mm. (6.25 in.). The whole upper plumage blackish brown, with fulvous or pale rufous margins to the feathers; wings and tail dark brown, edged with pale fulvous, the outermost pair of tail-feathers with a long diagonal streak on the terminal two-thirds of their length, the penultimate pair with a small white tip; supercilium, cheeks, chin, throat and breast vinous or cinnamon-red, the breast with a few black streaks; sides of the breast more thickly streaked; remainder of lower plumage fulvous, suffused with pink, the sides of the body heavily streaked with black; lores and ear-coverts vinous-brown.

Immature birds have the whole lower plumage fulvous, and the whole breast and the sides of the body with very broad black streaks. According to Oates (*Fauna Brit. Ind.*, Birds II, p. 310), "at each successive spring moult the young bird acquires more and more vinous on the head and breast, and probably becomes fully adult in three years."

Iris dark brown. Upper mandible and tip of lower dark brown, remainder of lower mandible yellowish horn-colour. Legs dusky flesh-colour (yellowish flesh-colour—Oates). Claws horn-colour.

*Distribution.* So far apparently recorded only from Bangkok, Central Siam.

*Habits, &c.* Similar to those of the last two species described, and found in the same localities, viz., the open fields round the City. This is a cold weather visitor. The first specimen obtained here was shot by Mr. E. G. Herbert in March 1914, and I have since obtained it regularly in February and March, when it is fairly common. It must, however, also be found in the earlier months of the cold season.

Family ALAUDIDÆ—Larks.

\*60. *Alauda gulgula sala* Swinh. *The Formosan Sky-Lark.*

*Alauda gulgula* (part.), Oates, *Fauna Brit. Ind.*, Birds II, p. 326.

*Alauda gulgula sala*, Williamson, Journ. N. H. S. Siam II p. 60.

Siamese, นกกระชาบ (Nok kra-chab fon).



*Description.* Length up to 165 mm. (6.5 in.). Upper plumage dark brown, the feathers broadly edged with fulvous; quills brown, narrowly tipped whitish—the first two or three primaries being edged with pale fulvous, while the edges of the remaining wing-feathers are more or less rufous; tail brown, edged with fulvous, except the outermost pair of tail-feathers which are white (barring the base of the inner web), and the penultimate pair, which have the outer web white; a pale supercilium from the nostrils to the ear-coverts; lower plumage pale fulvous, except the breast and flanks, which are darker, the cheeks being slightly, and the breast boldly, streaked with brown and black, respectively.

Iris brown. Upper mandible dark horn-colour, lower dull whitish, dusky at tip. Legs pinkish to brownish flesh. Claws pale horn-colour.

*Distribution.* So far only recorded, by myself, from the neighbourhood of Bangkok, Central Siam.

I have elsewhere (*antea*, p. 60) dealt fully with the occurrence of this bird in Siam—a fact which is of some interest, as it has only been procured, hitherto, in Formosa and South Hainan. There is no record of its occurrence in Indo-China, which would be expected, while it is represented in South China by another race, *A. g. calivox*.

*Habits, etc.* A resident here, and to be found in the open fields round Bangkok. I have not taken its eggs, but young birds procured in April and May appear to be referable to this species. If so, its time of nesting is probably much the same as that of its congener, *A. g. gulgula*, which is said by Oates to breed in Burma from December to April.

This bird is a true Sky-Lark, and sings while soaring on the wing in exactly the same manner as its European congener, from which it differs mainly in its smaller size. Any one walking across the fields round Bangkok, especially during the months when it is breeding, cannot fail, if he has an attentive ear, to note the continuous outpouring of the song of this bird, and a search sky-wards will soon reveal one or more of them, on fluttering wings.

The Siamese appear to have the same name for this bird as for the following species, to which it certainly bears a very close general resemblance. It differs from *Mirafra cantillans williamsoni* by its



longer and more slender bill, its larger size (wing up to 90 mm. against a maximum of 76 mm.), and its much longer and straighter hind claw. In *M. g. sala* this is as much as 25 mm. in length, while in *M. c. williamsoni* the hind claw does not exceed 9 mm. and is more curved.

\*61. *Mirafra cantillans williamsoni* Stuart Baker. *The Bangkok White-tailed Bush-Lark.*

*Mirafra cantillans* (part.), Oates, Faun. Brit. India, Birds II, p. 333.  
*Mirafra cantillans williamsoni*, Stuart Baker, Bull. Brit. Orn. Club, No. CCX (1915), p. 9.

Siamese, นกกระจิบหางขาว (Nok kra-chab fon).

*Description.* Length about 142 mm. (5.6 in.). Upper-plumage dark brown, with narrow grey-brown margins to the feathers; wing-coverts brown, with pale rufous margins; primaries and secondaries with rufous edges to the outer webs; outer pair of tail-feathers white, except for a brown diagonal band at the base of the inner web, the penultimate pair white on the outer web only, and the remaining feathers dark brown with pale edges; lores and supercilium fulvous to pale rufous; sides of the head mottled with brown and pale rufous; chin and throat whitish; remainder of lower plumage fulvous, darker on the thighs and under tail-coverts, and with the breast washed with rufous and streaked with brown.

Iris brown. Upper mandible dark horn-colour, lower pale horny. Legs pale flesh-colour. Claws pale horn-colour.

Stuart Baker, by whom this bird was named, has made the following observations regarding its differences from its two nearest allies:—

"It is nearest, not to typical *M. cantillans* from West and Central India, but to *M. philippensis* from Manilla and the Philippines.

"From *M. cantillans* it differs in being much smaller, with a wing varying between 68 and 73 mm.,\* as against 73 to 82 mm. in that bird. The upper surface is very much darker and the lower surface also decidedly so. In *Mirafra cantillans cantillans* the general tone of the upper plumage is a rufous sandy, the pale edges of the feathers dominating the dark centres; in *M. c. williamsoni* the general

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\* I have a specimen with a wing of 76 mm.



aspect of the back is dark brown, the edges of the feathers being much narrower, and grey or grey-brown in tint.

"From *M. c. philippensis* it differs in being rather paler and less black above, and in being decidedly darker and duller in tint below. Every specimen in the series also shows some rufous on the breast and flanks, which is never present in *M. c. philippensis*, and there are also fewer markings on the breast and lower throat than there are in that bird."

*Distribution.* So far only recorded from the vicinity of Bangkok, Central Siam.

*Habits, &c.* This a common resident bird, occurring in the fields outside Bangkok.

### Family NECTARINIIDÆ—Sunbirds.

62 (898). *Arachnechthra flammaxillaris* (Blyth). *The Burmese Yellow-breasted Sunbird.*

*Cyrtostomus flammacillaris*, Robinson and Kloss, Ibis 1911, p. 77; Robinson, Journ. F. M. S. Mus. V (1915) p. 152; Gyldenstolpe 1916, p. 33.

*Arachnechthra flammacillaris*, Gyldenstolpe 1913, p. 44.

Siamese, นกกินรี (Nok kin-pi).

*Description.* Length about 110 mm. (4.3 in.). *Male.* Upper plumage olive-brown, greenish on the rump and upper tail-coverts; the two middle pairs of tail-feathers entirely black, the others with white tips becoming progressively larger until, on the outermost pair, nearly one-third of the terminal portion is white; chin, throat and breast rich metallic purple, bordered by rich steel-blue; below the breast a band of dull rusty red, passing into dull black; axillaries orange-red; abdomen, vent and under tail-coverts yellow; sides of body dusky yellow; wings brown, edged with greenish brown; under wing-coverts yellowish white; edge of the wing yellow. *Female.* Differs from the male in having the entire lower plumage yellow, and in the absence of the orange-red axillaries.

Iris brown (light brown—Oates). Bill, legs and claws blackish.

*Distribution.* Recorded, so far, from all the divisions of the country except the Eastern and Western. It must, however, be found in them also, as it has been reported by Oustalet from French Indo-China, and occurs in Tenasserim.



*Habits, &c.* This bird is a resident species, and is a frequent visitor to our gardens, where it must attract attention owing to its general resemblance to a Humming-bird. The male, whose metallic purplish blue throat and breast are very noticeable, has quite a pretty little song in the breeding season. The birds are generally to be seen in pairs, and they are very partial to the large, brightly coloured flowers of the Hibiscus, into which, while clinging to a convenient stalk, they insert their heads and long curved bills for the nectar and minute insects on which they feed. They are unable to poise themselves in the air above a flower, as Humming-birds do, except for very brief intervals, and then only as a preliminary to settling on a stem. Their ordinary note is a double one, *tweet-tweet*.

63 (903). *Anthothreptes malaccensis* (Scop.). *The Brown-throated Sun-bird*.

*Anthothreptes malaccensis*, Ogilvie-Grant, Fasc. Malay. Birds (1905), p. 73; Robinson, Journ. F. M. S. Mus. V (1915), p. 152; id. Ibis 1915, p. 757.

*Anthreptes malaccensis*, Gyldenstolpe 1916, p. 34.

Siamese, นก คิน ปลี (Nok kin-pi).

*Description.* Length about 127 mm. (5 in.). *Male.* Forehead, crown, nape and sides of the neck metallic green or lilac, according to the angle from which viewed; rump and upper tail-coverts metallic violet purple; lores and sides of the head dull brownish green; a stripe from the gape down the lower side of the throat, metallic purple; chin and throat cinnamon-brown; lower plumage yellow, tinged with green on the flanks and vent; under wing-coverts and axillaries yellowish white; outermost pair of tail-feathers brown, the others becoming successively darker (until those in the middle of the tail are dark bluish brown), and with a gradually increasing amount of metallic purple or green on the outer webs; lesser wing-coverts metallic purple; median and greater wing-coverts olive-brown, tipped with cinnamon; quills brown, edged with olive-green. *Female.* Upper plumage dull yellowish green; sides of head greenish yellow, the ear-coverts dark; lower plumage yellow, greenish on flanks; tail brown, very narrowly tipped paler, and with all the feathers, except the outermost pair, edged with yellowish green on the outer webs; wings and



wing-coverts dark brown, edged with yellowish green.

Iris reddish brown. Upper mandible and anterior half of lower, horny brown, remainder pale orange-horny. Legs yellowish green, soles yellow to orange-yellow. Claws greenish horn-colour.

*Distribution.* Recorded from Central, South-eastern and Peninsular Siam.

*Habits, &c.* Very similar to the last species and, I think, just as common in Bangkok. The male is one of our most lovely birds, with its beautiful metallic upper plumage, one of the peculiarities of which is that it varies from dark green to lilac according to the manner in which the light falls. It is a larger bird than the one last described, and has a loud and rather insistent note of three syllables, *chu-chu-chu*, repeated many times, but I have not observed the male to have any song, as in that of *Arachnechthra flammarillaris*.

61 (911). *Chalcoparia phœnicotis* (Temm.). *The Ruby-cheek*.

*Chalcoparia phœnicotis*, Gyldenstolpe 1913, p. 45; id. 1916, p. 34.

*Description.* Length about 112 mm. (4.4 in.). *Male.* The whole upper plumage and lesser wing-coverts brilliant metallic emerald-green; lores blackish; cheeks and ear-coverts rich copper-colour, bordered below by a line of rich metallic lilac; chin, throat and breast ferruginous buff; abdomen, sides of body, vent and under tail-coverts yellow; under wing-coverts white to very pale yellow; greater wing-coverts black, edged with metallic green; wings dark brown, sometimes narrowly edged with whitish; outer tail-feathers brown, the others dark bluish brown, more or less edged with metallic green. *Female.* The lower plumage like that of the male; upper plumage and lesser wing-coverts olive-green; greater wing-coverts and wings brown, edged with yellowish green; tail brown (middle feathers darker) edged with yellowish green.

Iris lake-red. Bill black. Mouth yellow (Oates). Legs yellowish green. Claws yellowish horny.

*Distribution.* Recorded by Gyldenstolpe from Northern, Central and Eastern Siam, while I have obtained it from Bangnara in the Peninsular division of the country, and from Hup-bon, in South-eastern Siam. The only part from which it has not yet been reported



is, therefore, the Western division, but it must occur there, as it is found in Tenasserim.

*Habits, &c.* The only Bangkok specimens in my possession are a pair (♂ and ♀) obtained by Mr. E. G. Herbert on the west side of the river, where there are extensive tracts of fruit-gardens interspersed with large trees, and that gentleman informed me that he had seen the bird on other occasions. I do not think it is found in the more open districts of the east side of the river. Gyldenstolpe reports this species as "rather common" in Eastern, Central and Northern Siam, but that is not my experience in the parts I have visited. I should rather be inclined to say that, while widely distributed, it is nowhere abundant.

The male of this bird vies with that of the last species in the beauty of its colouring, and the glossy metallic green of its upper plumage is most attractive.

#### Family *DICÆIDÆ*—Flower-peckers.

65 (912). *Dicæum cruentatum* (Linn.). *The Scarlet-backed Flower-pecker.*

*Dicæum cruentatum*, Ogilvie-Grant, Fasc. Malay. Birds (1905), p. 74; Robinson and Kloss, Ibis 1911, p. 78; Gyldenstolpe 1913, p. 46; Robinson, Journ. F.M.S. Mus. V (1915), p. 152; Gairdner, Journ. N. H. S. Siam L. (1915), p. 149; Gyldenstolpe, *ibid*, p. 171; Robinson, Ibis 1915, p. 755.

*Dicæum cruentatum coccinea*, Gyldenstolpe 1916, p. 35.

Siamese, นก <sup>๕</sup>สีชมพู ถ้วน (Nok si-chomp'hu suan).

*Description.* Length about 89 mm. (3.5 in.). *Male.* Forehead, crown, nape, back, rump and upper tail-coverts crimson; lores, sides of the head and neck, wings and tail black; upper wing-coverts black with a bluish gloss; lower plumage pale buff, the sides of the breast black, and the sides of the body ashy brown; under wing-coverts and axillaries white. *Female.* Head, nape and back olive-green, the centres of the feathers of the crown darker; rump and upper tail-coverts red; tail black; the whole lower plumage ashy buff, darker on the sides of the neck and body; wing-feathers dark brown, edged on the outer webs with olive-green.

Iris dark brown. Bill black (fully adult male); upper mandible dark horny, lower mandible pale slate—tip dusky (female, and younger



male). Mouth black ( male ), flesh-colour to orange ( female ). Legs dark brown to blackish. Claws dark horny.

Referring to Gyldenstolpe's remarks (*op.* 1916, p. 35) as to the wing-measurements of the Siamese bird, it may be of interest to record that three adult males in my collection from Sriracha (S. E. Siam), Bangkok (C. Siam) and Bangnara (Pen. Siam), respectively, all have the wing measuring 48 mm.

*Distribution.* Recorded from all the divisions of the country, except the Eastern, where, however, I have observed it at Muak-lek, in the Dong Rek hills. It is, thus, to be found all over Siam, and in many places is one of the common species.

*Habits, &c.* This very small resident bird is abundant here, but possibly often escapes observation, despite the scarlet upper plumage of the males, by its habit of keeping mostly to the topmost twigs of trees. It is, moreover, of restless disposition, and seldom remains long in one place, but it betrays its presence by its rather staccato little note of *chi-chi-chi-chi*, rapidly repeated many times. Judging by captive specimens I have had, it appears to live chiefly on fruit, but it also doubtless takes small insects, and it makes a bright and pretty little cage-bird.

66. (914). *Dicaeum chrysorrheum* Temm. *The Yellow-vented Flower-pecker.*

*Dicaeum chrysorrheum*, Robinson and Kloss, Ibis 1911, p. 78.

*Dicaeum chrysorrheum*, Gyldenstolpe, Journ. N. H. S. Siam I. (1915), p. 171; Robinson, Ibis 1915, p. 756.

*Dicaeum chrysorrheum*, Gyldenstolpe 1916, p. 36.

*Description.* Length about 102 mm. (4 in.). Upper plumage and lesser wing-coverts yellowish green, brighter on the rump and upper tail-coverts; tail blackish; greater wing-coverts dark brown on the inner webs and yellowish green on the outer; wings blackish brown, the primaries and secondaries narrowly, and the tertiaries broadly, edged with yellowish green; sides of the head and neck yellowish green; lores, cheeks, chin and throat white, with a greenish brown mandibular streak below the cheeks; lower plumage whitish, boldly streaked with greenish brown; under tail-coverts orange-yellow to pale orange; under wing-coverts and axillaries white.

Iris orange-red to bright brick-red. Upper mandible and tip of



lower blackish, remainder bluish slate. Mouth black\* (flesh-colour—Oates). Legs dark plumbeous. Claws dark horn-colour.

*Distribution.* So far recorded only from Northern, Southern and Peninsular Siam, but I have also obtained it in Bangkok, Central Siam, and at Muak-lek, in the Eastern division of the country.

*Habits, &c.* My only Bangkok specimen was purchased from a bird-catcher here, who informed me positively that he had trapped it in this place, and that he got single birds now and then. I see no reason to doubt this statement, though neither I nor my collectors have come across the bird in Bangkok. The fact is, it is rather rare everywhere, and only single specimens are usually obtained. I have personally met with the bird twice only—once at Sriracha, S. E. Siam, and the second time at Muak-lek, in the Eastern division of the Kingdom. It is easily distinguished from the other Flower-peckers by its streaked lower parts and its yellow under tail-coverts.

\* 67 (922). *Piprisoma modestum* (Hume). *Hume's Flower-pecker.*

*Piprisoma modestum*, Robinson, and Kloss, *Ibis* 1911, p. 79; Gyldenstolpe 1916, p. 37.

*Piprisoma modestum modestum*, Robinson, *Ibis* 1915, p. 756.

Siamese, นก ตี๋ พลาย (Nok si-p'hlai).

*Description.* Length about 102 mm. (4 in.). Upper plumage dusky olive-green, lighter on the rump and upper tail-coverts; wings and tail dark brown, edged with olive-green, and the tail feathers tipped white—very narrowly in the centre, and increasingly so on the outer feathers; lores whitish; chin and centre of throat white; sides of the head and neck ashy brown, in some specimens with a faint green tinge; lower plumage whitish to sullied yellowish white, streaked with greenish brown.

Iris pale brick-red. Upper mandible and tip of lower dark horn-colour, remainder of bill plumbeous. Mouth orange. Legs dark slate-colour. Claws horn-colour.

*Distribution.* In the papers quoted above, this bird is recorded from Northern, South-eastern and Peninsular Siam, but I have also obtained it in Bangkok and at Muak-lek, in the Central and

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\* Adult female, 28th December, Sriracha, S. E. Siam.



Eastern divisions, respectively. It thus remains to be reported only from Western Siam, where it is almost certain to be found, as it is recorded from the Malay Peninsula and also from Pegu in lower Burma.

*Habits, &c.* I have, on one or two occasions, purchased specimens of this Flower-pecker, in Bangkok, from the bird-catcher referred to in connection with the last species, and he informed me he had caught them here. As the man lives in Bangkok, and traps most of his birds on the trees round about his house, I think his statement may be accepted. I have not met with this species at large locally, but as it is very small, and of dingy colouration, it is likely to escape observation. In some places it appears to be fairly common. Robinson (*Ibis* 1915, p. 756) records four specimens as having been obtained by Mr. C. Boden Kloss at Ok Yam, in South-eastern Siam, while I saw several (of which one was shot and preserved) at Muak-lek in the Eastern division of the country.

(*To be continued.*)



## ON A NEW MONGOOSE FROM SIAM.

By C. BODEN KLOSS, F. Z. S.

**Mungos siamensis**, nov.

*Types*:—Adult female (skin and skull) No. 2101. Obtained at Muang Prae, North Siam, on 11th May 1916, by Messrs. Williamson and Smith's collectors.

Adult female (skin and skull) No. 2469. Obtained at Lat Bua Kao, East Siam, on 18th Sept. 1916, by Mr. W. J. F. Williamson's collector.

*Colour*. Dull phase (No. 2101):—Pelage of the upper surface annulated; median area of back warm sepia and buffy white, the former changing to mummy brown on the sides; the short underfur of the same colour as the dark annulations but tinged with greyish. Fore and hind-feet speckled tawny and blackish; fore-limbs washed with tawny, their outer sides dark. Muzzle to nape deep ferruginous speckled with black. the muzzle blackish; space between eye and ear speckled paler ferruginous; ears tinged with ferruginous; lower cheeks clear bright tawny; chin and throat clear tawny buff, hairs of the rest of under surface of body greyish brown at base, buffy at tip, not annulated. Tail rather paler below than above, the median line washed with tawny especially at base and tip.

Bright phase (No. 2469):—In the rufous phase the whole of the upper surface is suffused with deep ferruginous (burnt sienna on the median line of back, rich tawny brown on sides and tail) and the short under-fur is also richer in colour than in the dull phase: but on the longer hairs the red is confined to the distal portions, so that buffy white annulations are still present basally and show through the red suffusion. Entire under surface of body and limbs ochraceous-tawny to tawny sharply margined: median line of tail below clear rich tawny.

*Skull and teeth*. Do not appear to show any special peculiarities.

There are slight differences in the skulls of the types, that from Lat Bua Kao being smaller and rather less aged with smaller bullae but greater post-orbital breadth: the termination of the palate is dentate



and the pterygoids are more parallel ; but these may be taken for the present as coming within the range of individual variation.

*Measurements.* See table p. 217.

*Specimens examined.* Three, the cotypes and another adult female from Muang Prae in the dull phase.

*Remarks.* The two dull examples from North Siam were taken in May and are exactly alike, but the traces of bright colour occurring on limbs and under surface of tail indicate, I think, that they possess a bright phase and that the specimen from near Korat, taken in September, is merely an example of this and not a distinct race.

At my request Mr. Oldfield Thomas has compared one of the Muang Prae specimens with the type of his *Mungos auropunctatus birmanicus* in the Natural History Museum; he writes "It does not appear to be *birmanicus* being distinguished by its reddish head, this in the Burma species being concolor with the body as in the ordinary Indian Mongoose. I think we should now use a binomial for *birmanicus*".

More recently the Indian Museum has lent me an example of a Burmese Mongoose obtained at Sawadi. The skin is somewhat fragmentary but it agrees with Mr. Thomas' statement in having no red on the head. The pelage is shorter and less harsh than in the Siamese animals but the soft under-fur is much denser while the annulations of the longer dorsal hairs are much narrower, deep buff in colour and only two in number.

The Burmese skull is a little smaller than the others but its post-orbital breadth agrees with the Lat Bua Kao example: its only other differences, apart from size, seem to lie in the closer approximation of the bullæ, which also diverge rather less posteriorly; the smaller size of the foramen magnum; and the narrow, parallel-sided interpterygoid space. The teeth are similar except that  $p^1$  and  $m^1$  are shorter and more compact.

*Mungos siamensis* is probably closely allied to *M. rubrifrons* of Hainan, which I only know from description (Allen, Bull. Amer. Mus. Nat. Hist., XXVI (1909), p. 240-2) and of which the external dimensions seem very similar save for a larger hind-foot (60 mm., s. n.). The Siamese form, however, is not grey in colour and has no shade of oliva-



ceous present while the under-fur is not blackish at the base; the dorsal hairs in *rubrifrons* have only two narrow pale bands (as in *birmanicus*), in *siamensis* there are five—one being basal. *M. rubrifrons* seems to have a modified rufous phase but is apparently altogether a duller animal, the pale phase being greyer and the bright less ferruginous.

Measurements in millimetres of *M. siamensis* and *M. birmanicus*.

			2101 ♀ co-type	2100 ♀	2469 ♀ co-type	Sawadi, Burma
Head and body	...	...	343	327	344	...
Tail	...	...	255	296	262	...
Hind-foot, s. u.	...	...	56	55	55	...
Ear	...	...	26	26	27	...
Skull:--						
Greatest length <sup>1</sup>	...	...	70.0	69.4	67.4	65.0
Condyllo-basal length <sup>2</sup>	...	...	68.8	68.0	66.0	63.3
Basal length <sup>3</sup>	...	...	64.7	63.7	62.3	61.0
Palate length <sup>4</sup>	...	...	37.2	37.0	36.0	35.0
Upper tooth row (c—m <sup>2</sup> ) alveolar	...	...	25.6	25.0	24.6	24.0
Basi-cranial length	...	...	26.7	26.0	24.3	24.1
Palate breadth at m <sup>1</sup> (external alveolar)	...	...	20.8	20.5	21.0	19.9
m <sup>1</sup> —m <sup>1</sup>	...	...	9.0	9.0	9.6	9.2
Rostral breadth above canines	...	...	13.0	11.5	10.8	11.0
Post-orbital constriction	...	...	9.1	9.2	11.1	11.1
Cranial breadth	...	...	23.5	23.0	23.8	23.0
Mastoid breadth	...	...	24.7	...	24.0	23.8
Zygomatic breadth	...	...	33.0	30.8	32.7	30.3
Greatest length of bulla	...	...	15.3	15.0	15.2	15.0
„ breadth across bullae	...	...	24.4	24.0	23.0	23.0
„ basi-occipital breadth	...	...	6.8	6.4	7.1	5.6
„ breadth of m <sup>1</sup>	...	...	6.6	6.2	6.4	6.0
„ „ „ pm <sup>4</sup>	...	...	5.0	4.5	4.4	4.9
„ length „ „	...	...	7.0	6.9	6.4	6.4
„ diameter „ „ (diagonal)	...	...	7.9	7.2	7.5	7.1

1 Front of premaxillaries to back of occipital crest.

2 „ „ to „ „ condyle.

3 „ „ „ front of foramen magnum.

4 „ „ „ termination of palate.



ON TWO NEW RACES OF *PALÆORNIS EUPATRIA* (LINN.).

BY C. BODEN KLOSS, M. B.O.U.

When visiting Eastern Siam last November I was not successful in obtaining any specimens of the large red-shouldered Paroquet, but my attention was drawn to it through seeing two or three examples in the possession of residents there; so when I returned to Bangkok and found that Mr. W. J. F. Williamson's collectors had been more fortunate than myself at Lat Bua Kao,\* I obtained the loan of his series for examination, and have also been lent a set of Indian and Burmese birds by Dr. N. Annandale and the authorities of the Indian Museum, Calcutta.

I propose to treat all these large birds with red patches on the wing-coverts as races of *Palæornis eupatria* (Linn.), of Ceylon, of which the first subspecies to be described was therefore *P. e. nipalensis* Hodgs., of Nepal, which differs in larger size, broader black mandibular band, more blue-washed occiput, nape and cheeks; and in having the feet yellowish, not olive.

Leaving out of account Peninsular Indian birds, to which various names (mostly unaccompanied by adequate descriptions) were applied by Hutton (Stray Feathers I, pp. 337-8), the next race to be discriminated was *P. e. indoburmanica* (Hume, *op. cit.* V. (1878), p. 457):

In separating this subspecies from *P. e. nipalensis*, Hume—having become a “splitter” for the nonce—yet deliberately included two races, diagnosed by himself, under the one name, “because there must be a limit to splitting up of this form”. To the logical ornithologist who accepts subspecies, there can be no artificial or sentimental limit to the number of forms recognised and named, so long as adequate characters for differentiating them exist. Hume's “portmanteau” name must therefore be confined to birds from the first locality cited—in this case fortunately those which are directly described—and *indoburmanica* thus applies to birds from the Sikkim Terai (typical locality) and also to those of Bhutan (*vide* Salvadori, Cat.

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\* About 30 miles west of Korat, E. Siam.



Birds XX, p. 439). They have no tinge of glaucous blue on occiput, nape or cheeks.

The other race indicated, but not named by Hume for the trivial reason quoted, differs in having a rather longer tail, a narrower black mandibular stripe and the base of the throat, below the black area, distinctly yellow. This I propose to call

***Palæornis eupatria avensis*, subsp. nov.**

Type:—Adult male collected at Bhamo, Upper Burma, by Dr. John Anderson on 18th January 1875. Iris "white bluish speckled."

Tail, 342; Wing, 217; Tarsus, 21; Bill:—culmen, 38; height of maxilla at base, 22; length of edge from base to tip, 30 mm.

It closely resembles *P. e. magnirostris* Ball, from the Andamans, but has a smaller bill and perhaps a yellower throat, while it lacks the narrow sky-blue neck-ring of that race.

*P. e. avensis* occurs also in Cachar (*vide* Hume, S. F., V, p. 21); in the Irawadi division (*id. op. cit.*, IV, p. 39); and in Central Tenasserim (*id. op. cit.* VI, p. 117).

Of Siamese birds I have before me from Mr. Williamson:—

- |                            |                           |             |
|----------------------------|---------------------------|-------------|
| 1♂ ad., 1♂ subad., 2♀ ad., | Lat Bua Kao, E. Siam.     | Sept. 1916. |
| 1♂ ad.                     | Sawankalok, Central Siam. | Jan. 1916.  |
| 1♀ ad.                     | Sukothai, Central Siam.   | Jan. 1916.  |

And an immature female of unknown provenance, purchased in Bangkok and given me by H. R. H. the Prince of Chumporn.

These birds differ from *P. e. avensis* in having the black of the throat still more reduced; the sides of the throat next the black decidedly yellowish, not green; the lower throat more intensely yellow; the red wing-patch much shorter (40 mm. against 60 mm.) and in having the occiput, nape and sides of neck markedly washed with glaucous blue ("cadet gray", Ridgway). For this I suggest the name

***Palæornis eupatria siamensis*, subsp. nov.**

Type:—Adult male obtained at Lat Bua Kao, E. Siam, on 19th September 1916 by Mr. W. J. F. Williamson's collector.

Iris, lemon yellow; maxilla, blood red with yellowish tip; mandible, orange red; feet, raw sienna.



Length, 491; tail, 272; wing, 203; tarsus, 17; bill:—culmen, 35; height of maxilla at base, 19; length of edge from base to tip, 26.5 mm.

The neck-ring, which scarcely joins the black of throat, is a beautiful "geranium pink", whereas that of *arvensis*, in the examples examined, is "strawberry pink": and the wing-patch is dull crimson ("neutral red").

Females lack the neck-ring and black throat, have very little yellow on the lower throat and possess smaller wing-patches than the males, but their irides, bills and feet are of the same colour. They seem but little smaller, and an adult from the typical locality measures:—

Length, 469; tail, 260; wing, 199; tarsus, 18; bill, 32, 19 and 25 mm.

The wing-patches of the Sukothai and Bangkok(?)\* females are much paler than the others, but this is a matter on which more evidence is desirable.

Speaking in a systematic sense, and not venturing to indicate the original home of the species, the Siamese birds seem to be going back to *P. e. eupatria*. As with so many species that are found in the Eastern Himalayas, through India to Ceylon and through Indo-China to Malaya, the Southern forms, though developing geographically along entirely different lines, eventually attain very much the same status as regards reduced size. The dimensions of *P. e. siamensis* are practically those of the Ceylon bird, but it lacks any trace of a black line between bill and eye, has the occiput suffused with blue-grey, the lower throat yellow, the lesser under wing-coverts pale bluish green and the feet yellowish, not dark.

The Saigon specimen recorded as *P. e. eupatria* by Salvadori in the Catalogue of Birds was in all probability a member of the present race, as also the six examples from Cambodia, cited as *indochinensis* by Oustalet who states (Nouv. Arch. du Mus. (4), 1, p. 223):—"Un de ces Oiseaux, un mâle, offre sur la nuque, comme un spécimen appartenant au Musée britannique et provenant également du Cambodge, une teinte grise au-dessus du collier rose; mais cette teinte ne remonte pas sur les joues comme chez le *P. nipalensis*."

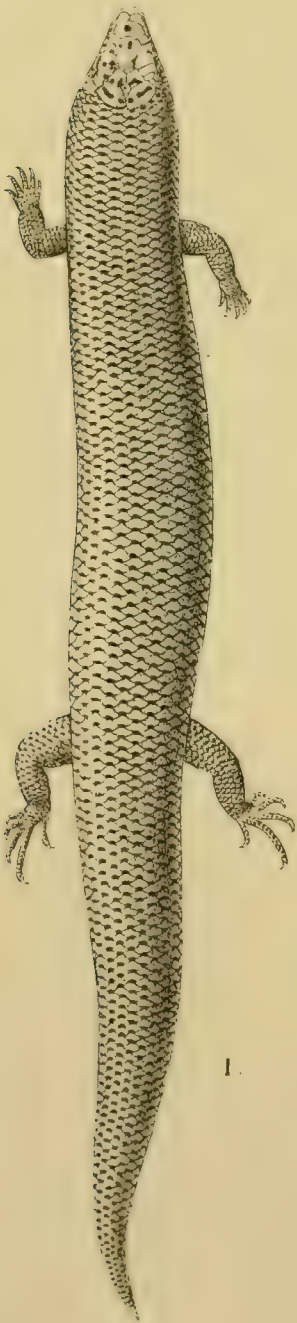
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\* The bird is not found in Bangkok. Eds.

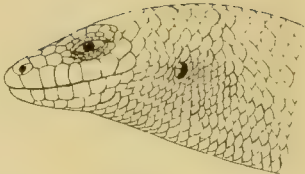








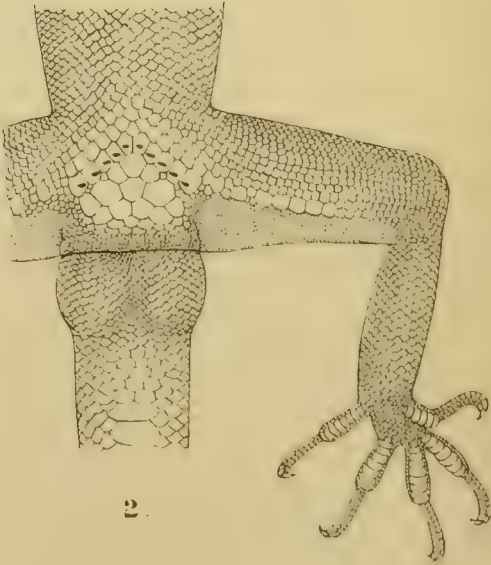
1.



1b.



1a.



2.

J. Green del. et lith

1. LOMA KORATENSE.

2. GYMNODACTYLUS INTERMEDIUS.



DESCRIPTIONS OF NEW REPTILES AND A NEW BATRACHIAN  
FROM SIAM.

BY MALCOLM A. SMITH, M.R.C.S., L.R.C.P., F.Z.S.

Types of all the species here described will be presented to the British Museum of Natural History, London.

***Gymnodactylus intermedius*, sp. nov.**

*Diagnosis.* Intermediate between *G. consobrinus* Peters, and *G. pulchellus* Gray; resembling the former in the arrangement of the praeanal pores, and the latter in colouration.

*Description.* Ear opening suboval, vertical or slightly oblique, as large as in *G. pulchellus*. Head granular, with small rounded tubercles on the occipital and temporal regions; rostral with a median cleft above entering the nostril; 10 or 11 upper and 10 or 11 lower labials; symphysial triangular; 2 or 3 pairs of chin-shields, the first pair forming a long median suture. Body and limbs covered above with small granules, intermixed with small, rounded, conical tubercles, not perhaps so distinctly keeled as in *G. pulchellus*, but quite as large; a lateral fold of enlarged tubercles. Ventral scales intermediate in size between *G. pulchellus* and *G. consobrinus*, about 40 to 45 in a transverse series. Male with a wide-angled series of 8 to 10 praeanal pores, not interrupted mesially; enlarged scales in front and behind; no pubic groove, no femoral pores, but a series of 7 to 10 large scales separated from the praeanal ones by an interval of about one scale. Tail above with small flat scales and rows of enlarged tubercles; below with transverse plates.

*Colour (in life).* Greyish brown with five dark brown cross bands bordered with pale yellow, the first band horse-shoe shaped from eye to eye across the nape. Below dirty white.

*Dimensions.* Head and body 85, tail 110 mm.

*Type specimens.* ♂ and ♀, from Khao Seab, near Chantabun, S. E. Siam.

*Remarks.* Five specimens in all were obtained upon the hill, at varying elevations up to 500 metres. They were caught beneath the



bark of decaying wood. One specimen is pale grey in colour above, almost uniform, the dark cross bands being hardly distinguishable. It appears to be abnormal.

***Lygosoma koratense*, sp. nov.**

*Diagnosis.* Section *Lygosoma*. - Body elongate; limbs short but well developed, widely separate when adpressed: ear opening distinct: two frontoparietals.

Near to *Lygosoma isodactylum* Günther, from Siam and Indo-China, from which it differs in the much stouter build, in possessing two frontoparietals, in the character of the ear-opening, and in colouration.

*Description.* Snout obtuse, lower eyelid scaly, ear-opening small, oval, half the size of the eye-opening, with projecting lobules anteriorly. Nostril between two shields, a large superior-anterior and a small posterior-inferior; no supranasals. Rostral convex above; nasals forming a median suture; frontonasal much broader than long, forming a broad suture with the frontal; praefrontals small and widely separate; frontal not very narrow behind, equal to or longer than the frontoparietal and interparietal together. Four large supraoculars; two frontoparietals; the parietals in contact; no nuchals. Fifth and sixth supralabials subocular. Body elongate; distance between the end of the snout and the forelimb twice in distance between the axilla and groin. 32 to 34 smooth scales round the middle of the body, subequal. No enlarged praeanales. Digits short, fourth toe a little longer than third; 13 to 14 keeled lamellae beneath the fourth toe. Tail thick, about as long as the head and body.

*Colour* (in life). Reddish-brown above, each scale tipped with black; flanks pale greenish yellow, the scales tipped with black as on the back, the colour sometimes extending to the base of the adjacent scales. Below yellowish white. Head scales each with one or more central black spots. Lips yellowish with large black spots.

*Dimensions.* Head and body, 105; tail (reproduced) 95; forelimb, 15; hind limb, 24 mm.

*Type locality.* Lat Bua Kao, near Korat, E. Siam, on the eastern slopes of the Dong Rek Mountains.



*Remarks.* Four specimens in all were obtained. They were found beneath fallen timber. One was brought to me alive, and was kept for some time. Its habits appeared to be entirely subterranean, and were similar to those of *L. isodactylum*.\* I never saw it above ground, though possibly it emerged during the night time. In loose mould it could burrow rapidly, using its snout for the purpose, the limbs being folded back along the sides of the body.

***Vipera russelli siamensis*, subsp. nov.**

A geographical race differing from the typical form in possessing an additional series of small, elongated spots on either side of the body, interposed between the usual three longitudinal rows of large ones.

The spots composing these two extra rows are considerably smaller in size than those forming the normal dorsal and lateral chains, are black in colour, with or without a lighter centre, and edged entirely, or in part, with white.

In other characters this form does not differ from the typical one.

*Type.* From Sam Kok, Central Siam, about 60 km. N. of Bangkok. Total length, 565 mm. Scales in 29 rows in mid-body; ventrals 163; subcaudals 44.

*Remarks.* I have examined four other examples of this well-marked race, one from Bangkok itself, and the other three from Klong Rangsit, Chiengrak Noi and Lopburi respectively, all localities within the central plain of Siam. They do not differ in any important respect from the type.

Many specimens of *Vipera russelli* from India and Burma show patches of small black dots upon the sides of the body, similar in position to the spots found in *V. r. siamensis*, but in no other respects resembling them. In a specimen from Pyawbwe, Lower Burma (lat. of N. Siam), however, there is a distinct series of marks very similar to those found in *siamensis*, but more irregular in shape and less clearly defined. Possibly this represents the northern range of this subspecies.

Russell's Viper is rare in Siam. Although it is evident that

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\* Journ. Nat. Hist. Soc. Siam, I, p. 127.



this species has descended into Siam from Burma, I have never yet seen any specimen from the North. One I believe was obtained in the Chiengmai district some years ago. Neither has it been met with south of Bangkok, and it is not known from the Peninsula. ,

***Callula mediolineata*, sp. nov.**

*Diagnosis.* Finger tips not terminating in truncated discs, toes nearly or quite half webbed, two large compressed metatarsal tubercles.

Nearest to *C. picta* Bibr., from the Philippines, and *C. verrucosa* Boulenger, from Yunnan and N. China.

From *C. pulchra*, the only other species of this genus at present known from the same region, it can be distinguished by the characters above-mentioned, and by the elongated mark on the posterior part of the back.

*Description.* Snout short, rounded. Fingers free, first shorter than second, the tips very slightly swollen. Toes moderate, nearly or quite half webbed, the tips not swollen. Subarticular tubercles well developed; two large, compressed, blunt-edged metatarsal tubercles, the inner largest, elongate, the outer two-thirds the length of the inner. The tarso-metatarsal articulation reaches the shoulder or the posterior corner of the eye.

Skin above smooth, or with small flat tubercles; a feeble fold may be present from the eye to the shoulder.

*Colour* (in life). Above light or dark olive, the snout paler, with a clear line of demarcation from eye to eye. A broad light yellow or brownish irregular stripe, from the upper eyelid to inset of thigh, and another, narrower one, from near the middle of the back to above the vent. Lower half of flanks, and limbs above, marbled with dark olive and buff. Below whitish or pale buff, the throat, and usually the chest, mottled with brown. Iris golden green, veined with black.

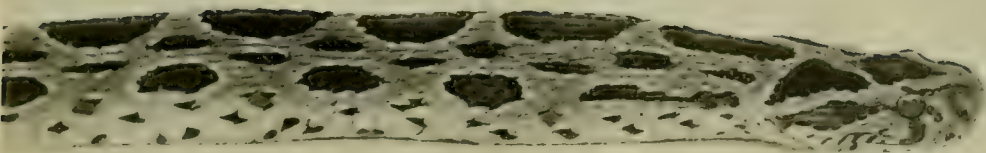
Light variegations may be present upon the back, and the yellow stripe along the side of the body may be indistinct or broken up. The median stripe appears to be constant, but is variable in length.

*Type locality.* Prachuap Kirikan, S. W. Siam.\*

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\* Known until two years ago, and marked on all maps up till that date, as Koh Lak.





1



2

James Green, Del.

1 *Vipera russelli siamensis*

2. *Callula mediolineata*.







*Remarks.* This species is described from examples (about 50) taken at Prachuap last November, having just emerged from the tadpole stage, and since kept by me alive. The practice of describing from specimens reared in captivity is, I believe, not a sound one, as certain modifications from the normal, particularly of the tips of the fingers and toes, and in the amount of webbing to the feet are liable to occur under the altered conditions. In this case, however, confirmation has been obtained from another specimen found at Nong Pling, near Paknampo, Central Siam, some 400 kilometres north of Prachuap. The length of this specimen is 88 mm. from snout to vent.

In both localities this frog was found in company with its ally *C. pulchra*, and with two other species of burrowing frog, *Glyphoglossus molossus* and *Calluella guttulata*. *Calluella mediolineata*, however, appeared to be considerably rarer than either of the other three, as in spite of the most diligent search on the same ground on many occasions since, only the one adult specimen has so far been obtained.

My Siamese collector says he is familiar with this frog, and that it occurs in the country round Ubon. It is known there as the "eung mawhai", and is eaten by the country people.

I wish to thank Mr. G. A. Boulenger, F. R. S., of the British Museum of Natural History, for his kind assistance in the determination of the two lizards; and Dr. Ammandale, D. Sc., of the Indian Museum, Calcutta, and Mr. N. B. Kinnear, of the Bombay Natural History Society, for sending me specimens of Russell's Viper from India and Burma to compare with my own from Siam.



A LIST OF THE BATRACHIANS AT PRESENT KNOWN TO  
INHABIT SIAM.

BY MALCOLM A. SMITH, M.R.C.S., L.R.C.P., F.Z.S.

Our knowledge of the Batrachian fauna of Siam has increased so much since Flower's article upon the subject in 1899,<sup>1</sup> that no apology is needed in publishing this list. A total now of 52 species against his original 20, will show how much has been accomplished in the last few years. Much, however, still remains to be done.

Of the frogs of the genus *Rana*, 21 species are recorded here, but many others are known from the neighbouring countries and will no doubt be found to inhabit Siam. The curious burrowing frogs, *Callula*, *Glyphoglossus* and *Calluella*, and the genus *Microhyla* are well represented, and the list of those given must be fairly complete. Of *Rhacophorus*, *Ixalus* and *Megalophrys*, principally hill dwellers, practically nothing is yet known, and many species should be discovered in the North and along the Western boundary.

In general bionomics much also remains to be accomplished, and in connection with this subject, I should like to draw the attention of members of our Society to the extremely interesting work which can be done in studying the larval forms of these creatures.

From Bangkok itself, Flower recorded 12 species, and I have only been able to add one more, namely, *Oxyglossus lacris murtensi*. Curiously enough it is one of the commonest frogs and abounds throughout the city. *Rana esculenta* I have not included in the 12, and doubt if it occurs in Siam at all. In spite of the wide range of this frog across Europe and Asia, it has been found nowhere else so far south, and it is more likely that the specimens said to have come from Bangkok have been wrongly labelled and were obtained in China.

Five more species may ultimately be found to occur in Bangkok, as I have introduced them myself in the past few years. They are

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<sup>1</sup> P.Z.S., 1899, p. 885. Notes on a Second Collection of Batrachians made in the Malay Peninsula and Siam, with a List of the Species Recorded from those Countries. By Stanley S. Flower, F.Z.S.,



*Rana nigrovittata*, *Rana lateralis*, *Glyphoglossus mollossus*, *Calluella guttulata* and *Bufo parvus*. The first named I heard quite recently during a storm of rain, but of the others I have had no knowledge since their introduction, and they may have died.

As will be seen from the brief remarks attached to each species, very few of those recorded are actually rare in the country. The majority are common, if not everywhere, at least in certain localities: and provided one knows how and where to look for them, there is usually no difficulty in obtaining specimens. Frogs and toads are chiefly nocturnal in their habits, and many have remarkable powers of concealing themselves by day. The burrowing frogs, and the representatives of the genus *Megalophrys*, are noteworthy in this respect, and in many localities I have only discovered their presence by their tadpoles.

In conclusion I should like to thank the following lady and gentlemen for their kind and valuable assistance in collecting specimens for me, and without whose help so complete a list could not have been produced:—

H. R. H. Prince Abhakara of Chumporn, Mrs. D. J. Collins, Messrs. C. J. Aagaard, P. A. R. Barron, G. F. W. Elwes, K. G. Gairdner, E. J. Godfrey, C. L. Groundwater, E. G. Herbert, A. J. Irwin, P. R. Kemp, A. L. Queripel, G. E. Webb, C. M. Weston, W. J. F. Williamson and H. C. St. J. Yates.

The geographical divisions referred to are the same as those used in my last list. (*antea* p. 49).

#### RANIDÆ.

##### 1. OXYGLOSSUS LIMA (Gravenh.).

Common and widely distributed. Found in Bangkok.

##### 2. OXYGLOSSUS LAEVIS MARTENSI (Peters).

Common and widely distributed. Found in Bangkok.

##### 3. ELACHYGLOSSA GYLDENSTOLPEI Andersson.

Recently described from Northern Siam (Zool. Results Swedish Exp., Band 55, No. 4, p. 15, 1916.)

##### 4. RANA KUHLI Dum. & Bib.

Peninsular, Western and Northern Siam. Common on many of the hills above 300 metres.



5. *RANA DORIAE* Bouleng.

Peninsular, Western and South-eastern Siam.

6. *RANA PILEATA* Bouleng.

Hills of South-eastern and Northern Siam. This new frog was described in the last number of this Journal.

7. *RANA LIMBORGI* W. Slater.

Peninsular and Northern Siam.

8. *RANA MACRODON* Dum. & Bib.

Peninsular, South-western and Western Siam as far north as Lat 17°.

9. *RANA RUGULOSA* Wiegman.<sup>2</sup>

Central and Northern Siam. Common all round Bangkok and the neighbouring country.

10. *RANA CANCRIVORA* Gravenh.<sup>3</sup>

Peninsular and Central Siam.

11. *RANA LIMNOCHARIS* Wiegman.

Common almost everywhere. Found in Bangkok.

12. *RANA GLANDULOSA* Bouleng.

Patani, Peninsular Siam.

13. *RANA ESCULENTA* Linn.

The British Museum has specimens of this frog said to have come from Bangkok.

14. *RANA MACRODACTYLA* (Günther).

Widely distributed and not uncommon. Found in Bangkok.

15. *RANA LATERALIS* Bouleng.

Central, South-eastern and Eastern Siam.

16. *RANA ALTICOLA* Bouleng.

Patani, Peninsular Siam.

17. *RANA MORTENSENI* Bouleng.

Koh Chang, S. E. Siam, and near Korat, E. Siam.

18. *RANA NIGROVITTATA* (Blyth).

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<sup>2</sup> & <sup>3</sup> Dr. Annandale's paper separating these two forms from the true *R. tigrina* of India, has not yet appeared, but preliminary mention of the confusion which has long existed with regard to these three species was made in the last number of this Journal, p. 91.



Widely distributed and not uncommon. Found chiefly on the hills.

19. *RANA HUMERALIS* Bouleng.

Nakon Sritamarat, Peninsular Siam.

20. *RANA ERYTHREA* (Schleg.).

Common and widely distributed, but not yet recorded from the North. Found in Bangkok.

21. *RANA LABIALIS* Bouleng.

Nakon Sritamarat, Peninsular Siam.

22. *RANA SCUTIGERA* Andersson.

Near Koh Lak, S. W. Siam (Zool. Results Swedish Exp. Siam, Band 55, No. 4, p. 15, 1916).

23. *RANA LIVIDA* (Blyth).

Doi Nga Chang, Northern Siam.

24. *RANA LARUTENSIS* Bouleng.

Raheng, Western Siam.

25. *RHACOPHORUS LEUCOMYSTAX* (Gravenh.)

Common almost everywhere. Found in Bangkok.

26. *RHACOPHORUS NIGROPALMATUS* Bouleng.

Peninsular and Northern Siam. Rare.

27. *IXALUS LARUTENSIS* Bouleng.

Hills of Peninsular and Northern Siam. Common on Doi Nga Chang above 1000 Metres.

28. *IXALUS ASPER* Bouleng.

Hills of Western Siam. (Rept. and Batrach. Malay Pen., p. 256).

29. *IXALUS HORRIDUS* Bouleng.

Patani, Peninsular Siam.

### ENGYSTOMATIDÆ.

30. *CALOPHYRUS PLEUROSTIGMA* Tschudi.

Patiyu, Peninsular Siam; Krabin and Khao Seabab, South-eastern Siam.

31. *MICROHYLA PULCHRA* (Hallow).

Common and widely distributed.

32. *MICROHYLA INORNATA* Bouleng.



Common and widely distributed. Found in Bangkok.

33. *MICROHYLA ORNATA* (Dum. & Bib.).

Common and widely distributed. Found in Bangkok.

34. *MICROHYLA BUTLERI* Bouleng.

Widely distributed, but not so common as the two preceding species.

35. *MICROHYLA ACHATINA* (Boie).

Common and widely distributed. Found in Bangkok.

36. *MICROHYLA ANNECTENS* Bouleng.

Patiyu, Peninsular Siam.

37. *MICROHYLA BERDMOREI* (Blyth).

Widely distributed. Common in certain localities.

38. *CALLULA MEDIOLINEATA* M. A. Smith.

Nong Pling, Central Siam; Ubon, Eastern Siam; Koh Lak, South-western Siam. Apparently much rarer than either of the next three species.

39. *CALLULA PULCHRA* Gray.

Common and widely distributed. Found in Bangkok.

40. *GLYPHOGLOSSUS MOLOSSUS* Günth.

Widely distributed. Common in suitable localities.<sup>4</sup>

#### DISCOPHIDÆ.

41. *CALLUELLA GUTTULATA* (Blyth).

Widely distributed. Common in suitable localities.<sup>5</sup>

#### BUFONIDÆ.

42. *BUFO ASPER* Gravenh.

Hills of Peninsular and Western Siam.

43. *BUFO MACROTIS* Bouleng.

Krabin, Eastern Siam; Sai Yoke, Western Siam; Patani, Peninsular Siam.

44. *BUFO MELANOSTICUS* Schneider.

Common almost everywhere. Found in Bangkok.

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<sup>4</sup> & <sup>5</sup> Records from S. W. Siam (Prachuap Kirikan) based on the tadpoles only.



45. *BUFO PARVUS* Bouleng.

Widely distributed. Not yet recorded from the North.

## PELOBATIDÆ.

46. *MEGALOPHRYS MONTANA* Kuhl.

Found on most of the hill ranges throughout the country. <sup>6</sup>

47. *MEGALOPHRYS NASUTA* (Schlegel).

Patani, Peninsular Siam.

48. *MEGALOPHRYS PELODYTOIDES* Bouleng.

Doi Nga Chang, N. Siam. Not uncommon above 1000 metres.

49. *MEGALOPHRYS HASSELTII* Tschudi.

Hill country of Peninsular, Western and Northern Siam, but apparently not at high elevations.

## SALAMANDRIDÆ.

50. *AMBLYSTOMA PERSIMILE* (Gray).

Obtained by Mouhot, probably on the hills near Luang Prabang.

## CÆCILIIDÆ.

51. *ICTHYOPHIS GLUTINOSUS* Linn.

Khao Pleung, Northern Siam ; Klong Bang Lai, South-western Siam ; Bangkok. Common in all three localities.

52. *ICTHYOPHIS MONOCHROUS* (Bleek.).

Khao Pleung and Doi Nga Chang, N. Siam.

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<sup>6</sup> Records from Northern Siam (Doi Nga Chang), and Khao Seab (S. E. Siam) based upon the tadpoles only.



## INSTRUCTIONS FOR PREPARING MAMMAL SKINS.

BY C. BODEN KLOSS, F.Z.S.

I have been invited by the Editors to draw up in some detail instructions for preserving the skins, etc., of mammals, for the use of those who wish to make collections. They have been written in the East for tropical residents, and if some makeshifts have been recommended, it is because it is impossible to send to a dealer and obtain a standard article at two or three days notice.

The business of preparing a mammal skin is really so easy, that with a little instruction and practice it can be successfully undertaken by any fairly intelligent individual; so there is no need to feel discouraged if at the first attempt it doesn't seem so simple, or the result so good, as was hoped for.

These instructions are to a great extent based on those drawn up by Mr. Gerrit S. Miller of the United States National Museum.<sup>1</sup> I learnt to preserve animals with an American friend whose collections were reported on by Mr. Miller, and who occasionally received from the latter suggestions as to the preparation of specimens; as I have met with no better method than that with which I first became acquainted I naturally propound it here. I have made, of course, various departures from the system advocated by Mr. Miller, and, in the same way, any one who learns to skin from this article will eventually evolve ways for himself that suit him better than mine do.

There is naturally more than one method in practice; for instance some collectors take off skins by a cut made *across* the lower abdomen: but I have described here one which seems to me as simple to carry out and as productive of good results as any.

The paper has been primarily written for members of the Natural History Society of Siam, and there is one thing about that country which should give encouragement and interest; which is that it has been investigated zoologically so little that there are still to be made plenty of discoveries in which any enthusiast may have a share.

## APPARATUS, ETC.

If the collection of mammals of small to moderate size is to be undertaken, it is well to lay in the following apparatus and materials:—

Scalpel or penknife.

Scissors, one blade at least pointed.

Small stone for sharpening knives.

Forceps 5 inches long with rounded ends two or three millimetres broad.

<sup>1</sup> Directions for preparing specimens of mammals. Part IV of Bulletin of the United States National Museum, No. 39. Third edition, revised. 1912.



Forceps 9 or 10 inches long for handling cotton bodies, etc.  
File.  
Pliers with cutting edge for wire.  
Compasses or dividers.  
Metric rule.  
Galvanised iron wire of several sizes. <sup>1</sup>  
A mixture of three parts powdered alum and one part arsenic,  
by weight.  
Cotton-wool, jute, wood-wool or coir. <sup>2</sup>  
Labels for skins and skulls. <sup>3</sup>  
Needles and thread, and pins.  
Spirit in a wide-mouthed receptacle.  
Sawdust. <sup>4</sup>  
Specimen box with trays. <sup>5</sup>

All the above are desirable for systematic work, but an occasional skin can be made in a sufficiently satisfactory manner with nothing more than a knife, some wood-ashes, dried grass or leaves.

1. It is not easy to indicate in a few words the kind of wire necessary where it is not sold by named sizes, but a supply ranging from one to three millimetres in diameter should be provided; the smaller sizes being for shrews, bats, rats, squirrels, and the larger for monkeys, civets, etc. If much collecting is expected, stretch and straighten, cut to suitable lengths and point beforehand. Some experience is necessary to judge of the lengths required: a wire that is too short is useless.

2. Two kinds of cotton-wool are desirable; a good quality for wrapping tail-wires of small animals, such as is sold in rolls by chemists; a commoner sort for filling small skins, of a kind that is sold in the bazaar for a few cents a bundle; silk-cotton will serve but is scarcely so easy to work with.

Wood-wool is the material used in packing china, glass and fragile articles; a limited amount can often be obtained from chemists and provision dealers.

Coir is the cleaned fibre obtained from the husk of the coconut, and is very useful for filling the skins of medium-sized and large animals.

3. Skin labels can be made of pieces of foolscap about 4 inches long by  $1\frac{1}{2}$  inches wide; this is doubled longitudinally and one end then folded back for about three-quarters of an inch, the thread being passed through a hole there. No. 12 cotton should be used, the ends knotted together at half to three-quarters of an inch from the end of the label, (see Fig. 1.). For skull labels, pieces of thin visiting-card about 1 inch by  $\frac{1}{2}$  inch can be recommended.

4. Fine sawdust obtained by sifting through a piece of mosquito net is invaluable for cleaning skins, soaking up blood and grease, and for obtaining a grip on slippery surfaces. If sawdust is not to be had, sand or dry earth will serve at times.



5. I recommend collecting boxes made as follows:—built of half inch planks well planed down, internal dimensions, 28 inches long, 14 inches wide and 10 inches deep. The box should be fitted with a number of light trays of various depths, say, one of three inches, one of one inch, and six of one-and-a-half inches, the latter size being that in most demand. The frames of the trays (*i.e.*, the sides and ends) should be well put together and the corners strengthened internally by extra wood, while a hole should be cut in either end for ease in lifting. The bottoms should be of some soft thin wood that will take pins easily and should be only lightly attached to the frames. This tray-fitted box should go into a second just large enough to contain it with its staple and padlock.

When starting on a collecting trip the bottoms should be removed from the trays (the tacks being carefully preserved) and placed on the floor of the box and the frames fitted in above them lining the sides; a large space will thus be available for packing apparatus and preservative materials. The smaller box is then placed within the larger. On arriving at the collecting locality the boxes are unpacked, the stores put in the larger and the trays fitted together in readiness for specimens to dry by day and be boxed up at night in some ant-free place. As the skins become dry they are unpinned from the trays and packed in the larger box.

This double-box system is proposed because I have always found that after a successful collecting trip one requires more boxes on the homeward, than on the outward, journey. The skins which are not yet dry can travel still pinned to the trays.

If it is expected that large or bulky collections will be made, several boxes should be provided.

#### METHODS OF COLLECTING AND TREATMENT OF SPECIMENS.

Mammals are to be obtained by shooting, trapping and purchase. A rifle is sometimes useful in open country, but nearly all small and moderate-sized mammals to be got by shooting, can be obtained with a twelve-bore gun and the following sizes of shot:—SSG, AA, 2, 5, 8 and, for small mammals at close quarters, cartridges loaded with half charges of powder and shot (10), the case being filled out by wads between the two.

The best trap for small mammals is a horse-shoe shaped pattern called the "Schuyler" which can be bought in nearly every town in the East; for carnivora, strong jaw-traps are best, but less easily obtained locally. They should have a chain or wire rope for attaching them to stout stakes or trees, and the bait should be hung above the pan about knee-high from the ground by a piece of string tied to the top of a long sloping stake.

If the local population is at all energetic or interested, individuals can often be stimulated by offers of reward to snare animals that the collector himself has little chance of obtaining or meeting. The extemporised trap is often better than the manufactured one.



Mammals which come to hand still alive can be killed by chloroform, drowning, or by pressure on the chest—in the case of the smallest kinds between the thumb and fingers; bites and scratches should be guarded against. Larger animals which are wounded and which it is not desirable to shoot again for fear of injuring the skins are most quickly put out of pain by placing a stout stick across the chest and standing on the ends.

Mammals should be skinned as quickly as possible after death. In hot climates they should be gutted as soon as obtained and the body cavity filled with cotton, paper or dry leaves; this practice is especially necessary with those that have been trapped during the night—presuming that the collector will be busy in the field in the morning and will not be able to commence skinning until the approach of mid-day.

If it is not possible to skin a specimen within a few hours after death, a few drops of formalin on the material placed in the body will delay decomposition for some time. Another method that may be resorted to when delay is unavoidable is to shut the specimens in a box in which a few drops of formalin have been sprinkled—but in this case all blood stains must be washed away at first or they will become fixed by the formalin vapour.

Small animals which have been well impregnated with pure formalin become mummy-like and will keep for years, though they do not become pretty objects with the passage of time. The method may serve for the preservation of an odd specimen at a pinch, but a collection made in this way is not likely to gain much appreciation.

### MEASUREMENTS AND LABELLING.

The following measurements should be taken with accuracy, of all specimens, *always exclusive of the hair*:—

1. Total Length. (tip of muzzle to tip of tail). Supple the specimen and place it back downwards on the measure, with the tip of the nose held steadily over zero; straighten out the body and tail without unduly stretching them and record the length to the end of the tail vertebrae.

2. Tail. Place the measure on the table so that it projects beyond the edge to the left for half an inch or so. Bend the tail of the specimen back at right angles to the body, fit the apex of the angle to the end of the measure, the body hanging vertically meanwhile supported by the hand (or the latter may be pressed on the base of the tail), straighten out the tail and read off the length.

3. Hind-foot. Measure with the compasses from the back of the heel to the tip of the longest toe, *exclusive of claw*. Straighten the foot before the measurement is taken. In the case of hoofed animals the measurement is taken from the tip of the hoof, bent downwards, to the heel, which is the joint above the cannon-bone. (Fig. 2).

4. Ear. Measure with the compasses from the extreme tip



to the lowest point of the orifice: never to the bottom of a lobe even if that is present as in monkeys, tree-shrews, etc. (Fig. 3).

Record these measurements, just as taken. Afterwards, at ease in the study, it is simple to obtain the length of head and body by subtracting the tail length from the total length. But among the discomforts of the field keep things as simple as possible.

Some directions recommend that the length of head and body should first be taken by itself and then that of the tail; but the method is not to be recommended as it is almost impossible to obtain uniformity and accuracy by it. In the case, however, of a few mammals like *Hylomys* and a few bats, etc., it has to be resorted to, and the tail is best measured with the compasses.

On the front of the label write the sex,<sup>1</sup> locality and altitude, collector's number, date, collector's name; on the back the measurements, collector's number, and any short notes desired. Fig. 1 will show how it is recommended that this should be done; the blank space at the top is left for the name of the animal after it has been critically examined.

On the skull label record the same number as on the skin, and the collector's initials; these details should be written in pencil on *both* sides. Care should be taken that no part of this work is overlooked; neither a skin without its skull nor a skull without its skin has half the value of both properly combined.

It is a good practice to keep in book form a register of specimens with columns headed as follows:—

Number.	Locality and Altitude.	Date.
Species.	Sex.	Measurements.

In this book are entered the same details as those recorded on the label with, in addition, an approximate identification of the specimen. By means of it there is no waste of time in learning the last number used, and an idea of the mammals preserved is obtained at a glance. Any information it is desired to record at length (colour of bare skin, further measurements, habits, etc.,) can also be written under the specimen number.

### SKINNING THE SPECIMEN.

It will perhaps be best first to give directions for skinning and making up a small mammal, such as a squirrel or rat, which will embody the general principles to be carried out; and to deal with variations afterwards.<sup>2</sup>

Lay the animal on its back, head to the right and (if it has not been gutted already) with knife held edge upwards cut the skin open along the middle line from the lower end of the breast-bone to the vent. Be careful not to pierce the flesh of the abdomen, which is

<sup>1</sup> Male, ♂; female, ♀

<sup>2</sup> Vide "Miscellaneous" and following sections.



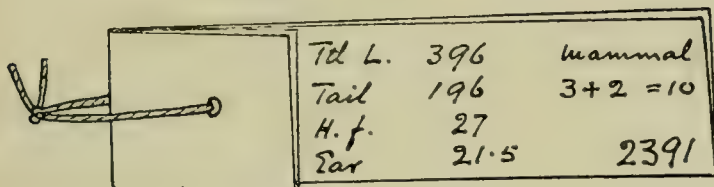
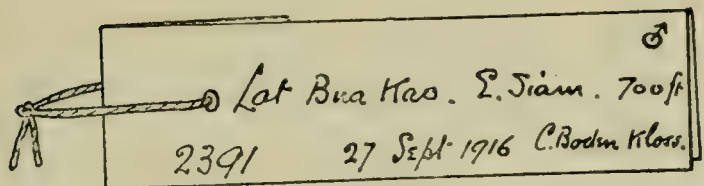


FIG. 1

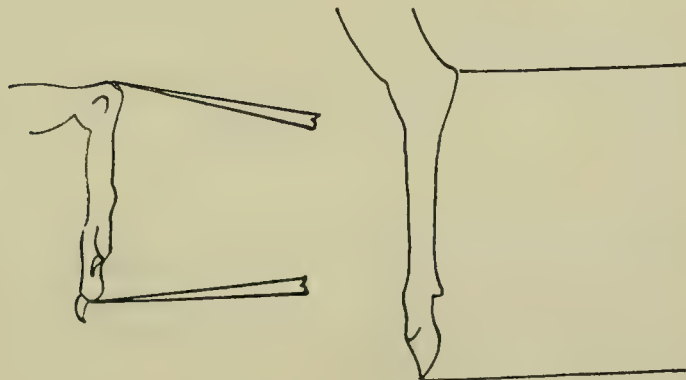


FIG. 2

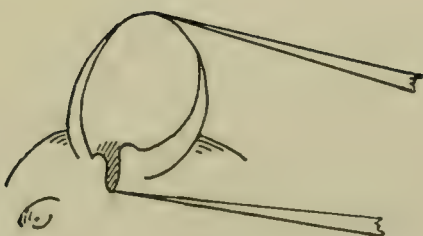


FIG. 3







very thin, or the intestines will protrude and get in the way. Do not be afraid of making a large opening; no object is gained and the skin will probably get badly stretched by trying to prepare the specimen through a small aperture.

Work the skin loose along one side, more by pushing and parting it from the flesh than by cutting; it is surprising how much skin can be freed in small mammals without cutting, but when it is necessary to cut don't hesitate; cut against the skin rather than against the flesh and don't be afraid to work boldly—little niggling cuts waste time.

When the hind-leg is well exposed and the skin loosened round the base, push it up from the outside and cut it through at the knee-joint. Pull the leg up from the inside stripping the skin right down to the heel and clear the flesh from the bone by cutting it through round the ankle and stripping it upwards, leaving the leg-bone attached to the foot.

Do the same with the other side and leg and then skin across the rump as high up as possible and round and up the base of the tail. Then by holding the tail-bones lightly between the forceps or the finger-nails, placed close against the inner side of the skin to retain it, with the other hand pulling against these, draw the tail-bones out.

Now turn the freed skin inside out over the shoulders and head, and skin upwards: a greater amount of cutting will be necessary here, as skin and flesh are rather firmly connected and it is well to skin as cleanly as possible at first, as much trouble is thus saved later on. While this is being done any pull on the skin should only be maintained at the place where the knife is being used, otherwise the skin may get unduly stretched or torn: the body will have to be turned occasionally so that skinning may be done evenly all round.

When the fore-limbs appear cut them through at the shoulder, work them out of the skin as far as the wrist, free the bone from flesh and cut away everything above the elbow.

Skin up the neck, working evenly round it, and when the ears appear cut them carefully through as close to the skull as possible but don't injure the latter. Soon after the ears are passed, the eyes will be reached; work the skin as far forward as possible and cut it free close to the bone without damaging the latter or the eyelids; a finger of the left hand placed on the outside of the skin and eyeball will be of assistance in obtaining this result.

Cut the skin from the skull until the lips are met; these are to be carefully separated from the jaws close to the bone until the skin hangs by the tip of the muzzle only: cut through the cartilage here close to the skin taking care not to injure the extremities of the nasal bones.

The business of skinning is much facilitated by a free use of sawdust which soaks up blood and grease and enables a grip to be taken on the slippery flesh and inner side of skin.



## TREATMENT OF THE SKULL.

Cut or twist the skull from the body, taking pains not to injure it in any way, and attach the label immediately. Skulls can then wait until the skins have been attended to.

In the case of small mammals like bats, shrews, rats or squirrels, if spirit is available, it is only necessary to attach the label: this is best done by passing one of its threads up into the mouth through the flesh below the tongue and tying it tight up to one side of the jaw: or a length of neck may be left attached to the skull and the label tightly tied to this. It is then put into spirit: if only a little of the latter is available, and room is required, the skull can be taken out after two or three days and dried.

If no spirit is at hand the brain should be extracted through the *foramen magnum*—the opening by which the spinal cord joins the brain. *In no case may the back of the skull be cut away in any manner or the edges of the foramen injured.* By first thoroughly breaking up the brain with a bit of stick or wire it can always be jerked or scooped out; water will help. The skull can then be placed to dry in the sun or above a fire where animals cannot get at it. Don't put any alum or salt on it.

With larger skulls the flesh and muscles of the temples and jaws, and the tongue and eyes, should be roughly cut away (care being taken that the delicate bones of the roof of the mouth are not injured) and the cranium emptied as already explained. They can then be put in spirit or dried straight away; but whether put in spirit or dried without previous treatment it is a good plan to soak all skulls in water for a few hours to extract as much blood as possible.

Skulls are finally cleaned by boiling or maceration, but this should not be undertaken in the field as the teeth and small bones frequently become loosened and get lost. The proper cleaning of skulls is something of an art and in the case of small ones, at any rate, should be left to a practised workman.

After the label is tied on, make a loop of the free ends of the threads; by means of this the skulls can, when dry, be threaded on a string or wire and run little risk of getting lost.

Dried uncleaned skulls should never be mixed with the skins as they may possibly breed beetles or other insect pests.

## TREATMENT OF THE SKIN.

Examine the skin and remove any flesh and fat still adhering: a few scraps of the former do not matter, but no large expanse nor lumps must remain. It is imperative that all fat should be cleared away: this is done by slicing it off with a knife, and scraping or snipping with scissors. Happily most animals are not fat, for the operation is tedious, but preservatives will not penetrate through fat; also the skin will become greasy and spoil. A good deal of fat can be finally absorb-



ed by rubbing with sawdust. Skins which are very fat and dirty may be washed with soap, or soda, and water, and dried with sawdust after draining.

Large blood-stains can be washed away with a pad of wool and water and the fur dried with sawdust: small ones may be left till the skin is dry and then cleaned by brushing or rubbing with sawdust.

Treat the inside of the skin with preservative applied with a brush or pad of wool, not forgetting the limbs: if the inside has got so dry that the powder will not adhere, damp it. Ordinarily, more preservative is not called for than will stick to the skin, but the lips, wrists and ankles should be freely treated and some powder should be shaken, or rammed with a wire, down the tail. Small skins can be proceeded with as soon as the preservative has been applied.

### MAKING UP THE SKIN.

Tear off a tapering piece of cotton-wool and wrap the slender end round an arm-bone a little above the wrist: do not wrap thickly here as all that is needed is that the wool may get a tight grip of the bone so that it will not slip when the limb is returned to its proper position: the broad end of the cotton should fill the upper part of the limb where there is no bone and project a little into the body-space. After wrapping the bone pull or push it so that the limb comes right side out. Having wrapped both fore-limbs turn the body, skin right side out and proceed in the same way with the legs.

Next take a piece of galvanised wire (of about the diameter of the lead in a pencil or a little larger) long enough to reach from the tip of the tail to the upper end of the body-opening, straighten it and point one end with the file. This wire is to support the tail and before insertion has to be wrapped with cotton-wool.<sup>1</sup> The best way to do this is to take a long slender wisp of wool much thinner at one end than the other, moisten the point of the wire and lay it on the table with one inch or so of the butt projecting: lay the cotton also on the table with its narrow end on the wire about half-an-inch below the point, the wire and cotton forming a **Λ**, place the left hand over both to keep them in position and with the other hand twist the wire towards the right; the result should be that the cotton becomes firmly wrapped about the length of the wire, tapering smoothly and evenly from butt to point, so that both together can be inserted into the tail: *the pointed end must reach the extreme tip*, otherwise the latter will get broken when dry. (However it is effected, the wrapping must be done so smoothly and tightly that it can be passed on the wire down the tail to its extremity without jamming or breaking the skin).

Take a piece of cotton-wool of a size to fill approximately the head and body of the skin, and pass a few turns of thread round one

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<sup>1</sup> Of the better kind referred to in the first section.



end, to more or less shape it and hold it together, for a distance representing the head and neck; wrapping with thread is not essential but frequently renders more easy the insertion of the stuffing material into the skin. Grasp the wrapped portion with the forceps and pass it into the body and up the neck until the end can be seen and gripped through the mouth opening; then remove the forceps from within and work the skin of the neck and body over the wool; or the latter can remain compressed in the forceps until the skin of head and shoulders has been arranged.

See that the wool of the limbs projects into the body, that of the fore-limbs towards the tail, that of the legs towards the head, and, if the body is not sufficiently filled out already, small pieces of wool can be inserted with the forceps where called for; this will often be necessary where limbs and tail join the trunk. Hold the cotton tightly in the forceps while inserting it and do not release it until it is in place.

The tail wire should be surrounded by the wool of the body, and the filling of the head drawn well up into the muzzle.

Now sew up the belly opening; it is not necessary to do this so carefully that no traces of a cut are visible, a few stitches inserted close to the edges are sufficient, but care should be taken that no undue amount of skin is sewn in or a false idea as to the breadth of the under-surface will be given.

Arrange the skin of the eyes neatly, and by passing a needle and thread through the top of the lower lip and once through each side of the upper lip, draw the edges of the mouth together and tie them so.

The filling material must not have been so forced into the skin that the specimen is hard and unyielding, but on the other hand sufficient must have been used to do away with any wrinkles or bagginess when the skin is sewn up.

Cut and straighten a couple of wires, a little longer than the distance between the fore and hind claws and sharpen one end of each. Cut small slits in the skin of the palms and soles and pass the pointed end of a wire through the sole of a hind-foot, work it gradually through the body-filling and out at the palm of a fore-foot on the same side. The fore-limbs should now lie close to the sides of the neck; and feet parallel to the tail, pointing backwards and soles downwards. Tie the skin label to the right hind-leg above the heel.

The skin ought now to be in fair shape, but place it belly downwards on the table and with the measure or a flat piece of wood, beat it along (not across) the back and sides; in fact treat it as if it were a pat of butter being smacked into shape; this process will smooth and flatten the stuffing material within so that when the skin dries it will do so without showing lumps and wrinkles.

No special effort should be made to get the specimen to assume a life-like shape, though the head and body and the tail should be of approximately the same length as before skinning. What should be



aimed at is uniformity in the appearance of animals of a kind; the sides should be parallel, the head and back of the same level throughout, and the head and neck together of about the same diameter. (Figs. 4 and 5).

The specimen should now be ready for placing in a tray.

### PINNING OUT AND DRYING.

Place the paws close to the head and press pins through them firmly into the tray; pin down the legs in the same manner, parallel to the tail. See that each pair of limbs is drawn out to the same extent, that the digits are close together and that the claws do not stick out upwards or sideways. If the tail will not lie correctly by itself, a few pins, crossed above it in pairs, will cause it to do so.

Long ears like those of rats and flying-foxes should be pressed back on to the head or neck and held in place until dry by a band of paper across the head with the ends pinned down outside the forelegs. (Figs. 4 and 5).

Animals with ears like squirrels in which both sides are furred, should have one ear pressed against the crown and the other bent downwards so that the colour of front and back surfaces can be seen at a glance. When the specimen is pinned out it may be given a final smoothing and shaping.

All mammals should dry somewhat flattened, which is the reason that trays of various depths have been recommended, as when the specimens are put away for the night the necessary pressure will be given by the tray above them. For shrews, pygmy-squirrels, and mice, trays of an inch in depth are almost more than sufficient, while even the largest mammals that the collector is likely to pin out for drying (civets, giant-squirrels, mouse-deer), should not be more than two and a half inches in depth from back to belly. An inch-and-a-half tray is suitable for the majority of small mammals.

It is not advisable to expose skins to direct sunlight if conditions will permit of drying less drastically, as such treatment often causes them to warp and buckle; cover them with a thin cloth or sheet of paper. However in very damp situations one is glad to dry specimens by any means available and periods of sunshine must be made the most of. If they have to be dried above fire take care that they don't get discoloured by smoke; it is a good plan to dry small skins pinned separately to bits of board and well wrapped up in paper, while larger ones can be wrapped in a cloth.

When the skins are quite dry, unpin them, and if they are to go on a long journey, wrap each small one separately in paper.

### MISCELLANEOUS.

In making "cased" skins of ungulates it is necessary to slit up the backs of the legs for some inches above the bases of the hoofs, as



otherwise the skin there cannot be freed from the bone (Fig 6, unbroken lines).<sup>1</sup> Cut away all muscles and tendons about the hoofs and lower legs.

Work the knife deeply round the bases of the hoofs and treat those places liberally with preservative. Afterwards a few stitches at intervals will be sufficient to draw the edges of the openings together. In horned animals the neck should be severed after it has been skinned as far as possible from the body end. To get out the head, a V shaped incision is made between the bases of the horns and continued down the nape in the form of a Y as far as is necessary. The skin surrounding the horns is cut through close to the base of the latter. (Fig. 7.).

In medium-sized and large animals the lips should be pocketed or split from the inner side where they were freed from the jaws, and much of the flesh between the skin and the mucous membrane cut away.

Working from the base where they were cut from the skull, the skin of the ears should be separated as far as possible from the cartilage within, and treated with plenty of preservative.

If the skin is thickened anywhere, as on the shoulders of pigs, it should be freely and deeply cross-hatched with a knife on the inner side, to allow the preservative to work through to the outer surface.

Animals of the size of the barking-deer or larger should have plenty of preservative *rubbed* into the skin, especially about the thicker portions, feet and lips. For twelve to twenty-four hours the skin should then remain rolled up into a bundle to sweat, hair side outwards and head and limbs in the middle, before it undergoes any further treatment.

If it is to be filled out with stuffing material it should not be rammed too full of the latter. Flatten it by beating or pressure, arrange the fore-limbs against the neck, and bend the hind-limbs forward at the groin until they lie along the sides of the belly, the hoofs pointing slightly outwards. The tail should be bent round against the belly. Keep the limbs in place while drying with a lashing of string, and make the ears dry close against the nape. It is often convenient for purposes of handling, to strengthen the specimen by thrusting a stout pointed stick through the body from mouth to vent.

Mammals above the size of a barking-deer make rather bulky specimens if their skins are filled out, and they are generally preserved flat unless specially intended for mounting. An excellent method of dealing with medium-sized mammals, however, is to make "cased" skins of them in the first instance, and afterwards, when they are nearly dry, to remove the filling material from the neck and body, flatten out these parts and then double the skins across the middle

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<sup>1</sup> "Cased" skins are those which are only partly opened, and are thus distinguished from "flat" skins, which are completely opened.



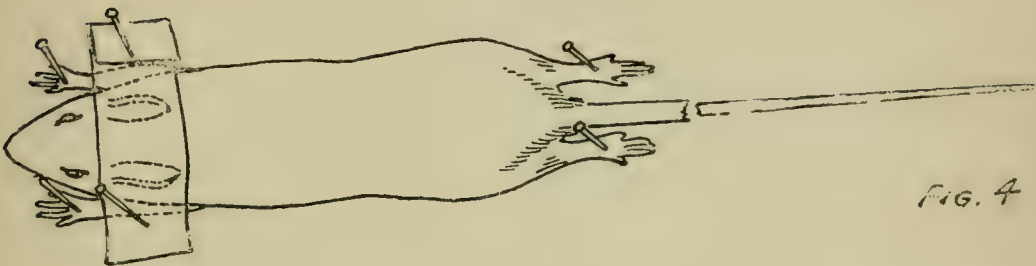


FIG. 4



FIG. 5

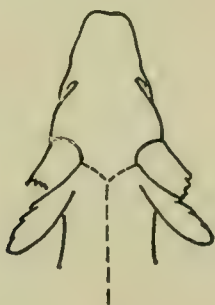


FIG. 6

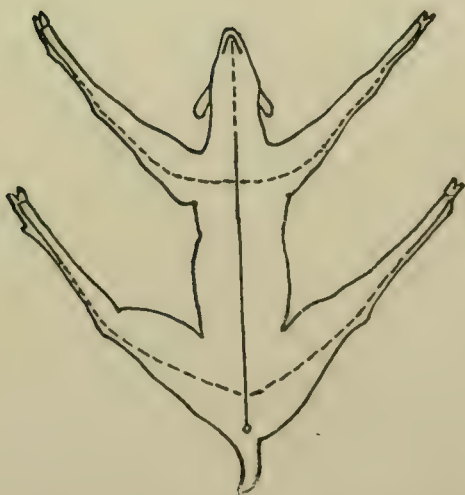


FIG. 7







of the back outwards, so that head and buttocks come together. Monkeys should always be wired, and so cannot be folded up, but the larger civets, jackals, barking-deer, serows, etc., make very satisfactory specimens treated in this manner.

In animals larger than a common squirrel, a filling of wood-wool or coir is preferable to cotton and it will not be possible to insert more than the head and neck in one piece. Do not make the latter too long; if it has stretched longitudinally in skinning it can be shortened to some extent by stretching it laterally afterwards.

The wrists and ankles of monkeys are so slender that it is very difficult to get at the extremities from inside the limb-skin. Palms and soles, therefore, should be slit open from the base of the digits, and the cuts continued for two or three inches along the inner side of the wrists and round the heels up the back of the ankles. Clean the extremities of flesh and fat, open up the skin as much as possible and force a pointed wire, etc., up the fingers to give the preservatives, which should be freely applied, an opportunity to penetrate to the tips.

The collector will have to be guided by circumstances as to whether he leaves the limb-bones of monkeys in the skin (leg and thigh, arms and forearm) or removes them all; the latter is the less ideal, though decidedly the quicker method, in spite of the fact that stuffing material will have to be put into the limbs piece-meal by means of a ram-rod. In either case wires should be used as directed for smaller mammals. After the specimen is flattened out, the tail should be bent at the root to lie along the under-surface; if it extends beyond the head it should be recurved at the end; the bends in the tail-wire should be curves, not sharp angles; the fore-limbs should be bent at the arm-pits until they press against the belly with the hands touching; and the legs turned up at the groin until they lie along the sides of the body.

Specimens thus shaped are not pinned out. Bind the limbs in position until dry: it is sufficient to close the mouth by tying the lips together with single stitches in two or three places. Flatten the muzzle and don't try to model the face at all.

Animals like cats, civets and giant-squirrels should also have the tails bent round to lie against the under surface of the body: this position does not interfere with pinning out on trays, and is the safest place for the tails of all medium-sized animals.

The palms and soles of cats, dogs and civets should be opened up by longitudinal cuts for purposes of cleaning, applying preservative and hastening drying. Whenever the cut is a long one the edges should always be brought together with a few coarse stitches.

In getting out the tails of monkeys, cats, etc., some force will have to be used. Skin as much as possible round the rump and root first, then grasp the vertebrae lightly between the flat sides of a couple of sticks held rather loosely together; place a foot on the base of tail,



the animal lying on the ground back-upwards, and pull the skin off the bones; the hands, both available for the purpose, holding the sticks in such a manner that while the bones slip through easily, the skin cannot follow.

### BATS.

These should be skinned much as directed above, but the greater part of the thigh and upper-arm bones should be left in the skin, though their heads may be cut off; and they need not be wrapped. If the tail is very short or slender it may be left in the membrane, cutting it off where it joins the rump.

Pin the specimen to dry with the forearms lying close against the sides of the body and the legs backwards as in other mammals. The fingers and membrane should be gathered up and held in place by pins close against the forearm, and the extremities of the wings may be allowed to dry pressed against the abdomen where they will not be in danger of getting broken. Care should be taken that the thumbs do not project in drying and that their claws lie close up against the wings.

Except "flying foxes" and other large species, the majority of bats should be preserved in fluid.<sup>1</sup>

### LARGE MAMMALS.

The skins of large mammals such as sambur, tiger, etc., are preserved flat: they are opened by cuts made as shown in Fig. 6 (unbroken and dotted lines together).

After the median body-cut is made, the skin of the legs should be opened upwards from the feet, cutting up the back of the leg until the first joint is reached, when the cuts should be gradually brought round to the inner side of the limbs.

The measurements already advocated should be taken, together with any others that may seem of interest, such as height at shoulder.

If the mask only is to be kept, an ample length of neck-skin should be retained. All natural folds of skin—eyelids, dewlaps, etc., besides those previously mentioned—must be split and opened out from inside. Skins that are destined for mounting should not be pegged out or stretched while drying, and all the leg-bones should be kept, tied together and labelled. When nearly dry, skins should be rolled up or compactly arranged with as few sharp folds as possible.

A preservative that never seems to fail with large skins, from that of an elephant downwards, is formalin in a four or five per cent solution.

It has, however, one great drawback where facilities for packing are limited and transport of heavy or bulky objects is impossible, in that skins so preserved must not be allowed to dry if subsequent treatment, such as mounting, is required; for once dry and hard

<sup>1</sup> *Vide* "Alcohol and Formalin", p. 245.



it does not seem possible to relax a specimen so treated. Provided, however, that the skin can be kept moist with the preservative fluid, which is sufficient after a few days immersion, there is nothing better than formalin on account of its portability before use and reliability in action.

The next most satisfactory preservative is perhaps salt and alum combined. The first alone is doubtfully effective in keeping the hair fast for any length of time, and the latter by itself will not penetrate thick skins with sufficient rapidity.

At first salt should be plentifully applied to both sides of the skin, and well rubbed in occasionally on the fleshy side with pieces of wood or stone: in the intervals the skin should be folded up, hair side outwards, and allowed to pickle. When twelve to twenty-four hours have elapsed, it should be treated to rubbings of powdered alum and finally allowed to dry. Thickened areas of skin should be cross-hatched or shaved down as much as possible at an early stage of the proceedings.

### ROUGH PRESERVATION OF SKINS.

If it is desired to preserve an interesting specimen when no apparatus and preservatives are at hand, take its measurements with twigs, or piece of string or a liana, and skin as directed above. Take special pains to free the skin from all flesh and fat and to clean and open up the feet and ears as much as possible. Then treat it liberally with wood-ashes well rubbed in.

In small mammals, or those with short tails, a skewer of bamboo, piece of rattan or the rib of a palm pinna can be used to extend the tail: but long tails like those of cats, civets, or monkeys should be simply laid along the under side of the body, after making a small slit beneath the tip, to ventilate the inside and aid drying. Wind some crumpled paper or dried grass round the limb bone and fill out the skin with dry leaves, etc. Shape as well as possible and dry quickly.

Large skins should be opened out flat and treated with several applications of wood ashes while drying: hasten the latter process as much as possible.

With fair opportunities for drying there will be good prospects of skins so treated making satisfactory specimens.

### ALCOHOL AND FORMALIN.

If it is not convenient to skin small mammals they can be preserved in spirit or formalin.

Add to alcohol (methylated spirit is quite satisfactory) one fifth to one sixth of its volume of water, and mix one part of formalin with twenty to twenty-four parts of water.

Label the specimens in pencil on stiff paper or visiting-card and gut them thoroughly; afterwards soaking them in water for a few hours to extract as much blood as possible. At first keep them immersed in



plenty of fluid, less is required afterwards; and when they are thoroughly preserved they may be packed, merely moistened with the preservative liquid, in tins or bottles.

This method should be used for most bats, especially the leaf-nosed forms and other insectivorous species. Only after several examples of one kind have been collected should one or two be skinned for the sake of their colour, which, in small bats, is not a character of the first importance.

Fairly large animals should be stabbed with a pen-knife a few times in the fleshy parts distant from the body (the upper arms of flying foxes for instance), otherwise the preservative fluid, which works from within the skin, may not have time to penetrate to those portions before they begin to decompose.

### SKELETONS.

Remove the skin in a single piece by cutting it open from mouth to vent and slitting up the under side of the limbs from wrists and ankles to the median cut: leave the skin on the fore and hind feet of small mammals. Preserve the flat piece obtained for purposes of identification.

Remove the viscera and roughly clean away the larger masses of flesh from the bones, but do not disjoint any of the latter, except the skull which it may be necessary to separate in order to extract the brain. Soak the bones in water for some hours to remove the blood, and then dry quickly.

Label the various separate parts with the same number and details.

Skeletons of large mammals are prepared in the same way but may have to be broken up for purposes of transport. The skull and limbs can be disjointed from the trunk and the latter prepared in two pieces by carefully separating two of the median vertebrae.



## DESCRIPTION OF A NEW MACAQUE FROM SIAM.

BY C. BODEN KLOSS, F.Z.S.

***Macaca siamica*, sp. nov.**

*Type.* Adult male (skin and skull) No. 2530/ C.B.K. Collected in the Me Ping rapids below Chi-ngmai, North Siam, 850ft, on 11th April 1916 by K.G. Gairdner. Original No. 320.

*Characters.* A small macaque, with dark grey shoulders, bright ochraceous rump and greyish limbs, of the same group as *rhesus* and *assamensis*, with tail about half the length of head and body, untufted and evenly furred throughout (as in the long-tailed "crab eating" macaque). Size and skull characters about as in *M. brevicauda*<sup>1</sup> of Hainan, to which it is probably most nearly related.

No form of crest; hair of crown growing straight back from the forehead, not lengthened nor radiating; hairs on sides of head and neck only slightly lengthened; no mane. Buttocks covered with hair to the edges of the callosities.

*Colour.* A few stiff black hairs above the eyes and numerous finer black hairs scattered over the face.

Top of head to lower back deep-mouse-grey, the extremities of the hairs with two ochraceous-buff and two blackish annulations, the lumber region slightly tinged with russet; shoulders, fore-limbs and hands intermediate between natural grey and deep mouse-grey, the hair of the shoulders faintly annulated, of the fore-arms tipped, with very pale buff. Rump and upper thighs light neutral-grey with the distal portions of the hairs bright ochraceous-orange, which is the dominant colour of those unspeckled areas; hind-limbs and feet pale neutral-grey with a yellowish tinge, their outer sides washed with pale ochraceous-buff; buttocks pale dull buffy.

Face, sides of neck and underparts of body pale grey with a slight yellowish tinge most marked on the abdomen.

Hairs of upper side of tail with light neutral-grey bases, those

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<sup>1</sup> *Pithecus brachyurus* (nec H. Smith), Elliot, Ann. & Mag. Nat. Hist., (8) iv, p. 251 (1909).

*Pithecus brevicaudus* id., Review of the Primates, ii, p. 216 (1913).



of the basal portion annulated with ochraceous, those of the distal part buffy-grey, an indistinct dark median line; underside pale buffy grey. (The last inch of the upper surface is clad with short blackish hairs, but as the underside is uniformly haired to the end, this is possibly the result of some accident).

"Orbital skin pinkish red, anal skin bright deep pink, abdominal skin bluish, palms and soles dark hair brown" (K. G. G.).

*Skull and teeth.* The skull, though fully adult with much worn canines, slightly worn molars and with sutures obliterated, is of a somewhat infantile type, light in structure and lacking crests or ridges. The orbits are almost as high as broad, as in *M. breviceauda* to which there is a close general resemblance; but in *siamica* the muzzle is longer and broader and therefore the face more sloping, the orbits are also less vertical, with their outer sides more retreating, the zygomata are lighter and the nares more elliptical, less V-shaped. The upper tooth rows are more parallel than in *breviceauda* and the posterior nares are broader. The mandible is of the same type though longer, but the ascending ramus is considerably narrower, with its anterior edge sloping backwards from below, instead of being nearly vertical.

*Measurements.* Collector's external measurements taken in the flesh:—head and body, 495; tail, 235; hind foot, s u., 137; ear, 33. Skull:—greatest length, 119; condylo-basal length, 92; basal length, 83; palatal length, 52; upper molar series (alveoli), 31.6; m<sup>2</sup>—m<sup>2</sup> (alveoli), 21; breadth of rostrum across canines (alveoli), 33; occipito-nasal length, 100; breadth of brain case, 59; external biorbital breadth, 65; zygomatic breadth,  $\pm 80$ ; mastoid breadth, 66; orbits 23  $\times$  25; greatest length of mandible, 87.5; lower molar series (alveoli), 36.6; height of coronal process, 45.5; horizontal breadth of ramus through condyle, 25.

*Specimens examined.* One, the type.

*Remarks.* To this species possibly belongs the animal referred to by Blanford as coming from the Laos country in Upper Siam (Fauna. Brit. Ind. Mammals, p. 15).

Mr. Gairdner notes on his specimen, "Common along the banks

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<sup>1</sup> Thomas and Wroughton, Ann. & Mag. Nat. Hist., (8), iii, p. 381 (1909).



of the Me Ping River but very hard to get, as it comes to ground and runs off." This is the habit of *nemestrina*, *adusta* and *rufescens* also, at the slightest cause for alarm, and, apart from the amount of lead they will carry away, explains why they are so comparatively rare in collections.

Of the several groups of macaques that occur in Siam, *siamica* represents the moderately short, furry-tailed section, to which belong also *rhesus* and *assamensis*, and possibly *resimal* from Java. I have compared it with *brevicauda*, of which the tail is said by Swinhoe to be clothed with "thin harsh adpressed hair projecting  $1\frac{1}{2}$  inch beyond the bone" (P. Z. S. 1870, p. 227, under *Macacus erythraeus*).

Other groups are the "stump-tailed" section including *arctoides*, of which *rufescens* Anderson, and *harmandi* Trouessart, both recorded from Siam, are possibly subspecies; the "pig-tailed" group, containing *nemestrina*, of which *adusta* and *insulana* Miller, and *andamanensis* (= *leominus*) all seem to be local representatives; and the long-tailed "crab-eating" monkeys, *irius* Cuvier, to examples of which from Peninsular Siam, Elliot has given the name *capitalis*.



## MISCELLANEOUS NOTES.

No. I. Remarks on *Bos sondaicus* ( the Tsine or Banting )  
and on *Bos sondaicus porteri*.

The upper photograph is that of a bull Tsine shot by Mr. A. A. Porter some nine years ago in the Me Wong district about eighty miles north-west of Paknampoh in Central Siam. This bull, undoubtedly aged, judging by the deep corrugations in the horns, differed from any previously recorded specimens, in that the black, or dark brown, skin of the whole body was spotted with white, each spot the size of a sixpence. The head and part of the skin were sent to the British Museum, and on this material Lydekker based his subspecies *Bos sondaicus porteri*.

In 1909, Mr. Elwes shot a similarly marked bull in the same area, and the head of this animal is shown on the right hand in the lower illustration. This also is an aged animal, the teeth worn flat and both horns blunted and corrugated.

Major Evans (Big Game Shooting in Burma) states that he has seen black bulls, and it seems to be a generally accepted fact that old bulls of this species are often gray and sometimes black (in the Javanese race usually black) although Rowland Ward (Records of Big Game, 1899), wrongly states that in the Burmese variety "old bulls retain the reddish tint of the cow throughout life".

Had Major Evans struck herds of black Tsine, he would undoubtedly have said so, but he evidently found these black bulls on the same ground and among herds of Tsine of the ordinary colour, viz., reddish-yellow or light chestnut, a colour rather lighter than that of the Siamese Barking Deer.

Messrs. Elwes and Porter obtained their spotted bulls on the same ground as where they shot numerous animals of the usual colour, and this year Mr. St. John Yates writes me that he has obtained a spotted bull from another herd in that district. I have not compared skulls of Me Wong animals with any from Burma, but can find no sensible difference in any cranial dimensions among the three heads shown in the photograph, and two of which were yellow bulls; nor do these differ in any way from the skull of a grey-faced hill-bull obtained by the writer in the Raheng district last year. The measurements accord with those given by Blanford of a male skull from Borneo.

Change of colour in the male, due to age, being recognized, and and there being no record of black or spotted cows, Lydekker's subspecies *B. s. porteri* appears to be unnecessary.

Major Evans has recorded the habits of this animal very fully as regards Burma, and I can bear out his statement that in the hills Tsine are easily stalked, having approached to within 10 yards





*Bos sondaicus porteri.* Lyd.



Heads of Tsine (*Bos sondaicus*).







and shot, at two p.m., a bull which had that morning been feeding with the herd among the pines, at an elevation of 2500 feet. From the appearance of the numerous paths running along the faces of the steep hillsides, that high elevation appeared to be a hot weather resort for the herd. In the Me Klong they were as a rule found at a much lower elevation, in mixed and deciduous jungle, and in the Me Wang I understand they (and occasionally Gaur) are usually found in dry jungle subject to annual forest fires.

The lower photograph shows three good heads obtained by Mr. Elwes in the Me Wang district, the central head being the best so far recorded from Siam, and would stand a good third in Rowland Ward's list for the species, a good third, advisedly, as eight years elapsed before the writer's measurements were taken, and the bases have undoubtedly contracted considerably.

*Cranial measurements of Siamese Tsine in inches.*

	Left.	Centre.	Right. Spotted bull.	Raheng hill bull.
Greatest upper length including crest	20.7	20.5	20.0	20.8
Basal length ... ..	18.2	—	17.8	—
Zygomatic breadth ... ..	9.3	—	8.7	—
Greatest orbital breadth ... ..	9.2	9.7	9.1	9.1
Least do. do. ... ..	7.1	7.3	6.5	6.7
Length of upper tooth series ... ..	5.7	—	5.6	5.8

The record head, from Upper Burma, has a length of  $33\frac{1}{2}$  inches on the outside curve and circumference of 17 in. The measurements of the central head shown are 28.6 and 15.5 respectively, with a span of 34.7 ins., and tip to tip 27 ins.

K. G. GAIRDNER, C. M. Z. S.

March, 1917.

**No. II. Note on the Bay Cat (*Felis temmincki*)**

Supplementing the note by Mr. Kloss in Vol. II, p. 79 of this Journal, the following note on one of this species obtained in the rapids below Chiengmai (N. Siam) may be of interest. The specimen, a male, was found in the early morning crouching on a small rock at the base of an overhanging cliff, and could only have reached the rock by swimming some distance in deep water. The boatmen held the beast under water with boat-poles and drowned it, and I am uncertain of the colour of the eyes—the liquid green of the enlarged pupils occupying the whole eye. The measurements were:—length 26.4 inches; tail 15.3; height at shoulder 16; ear (from skull) 2.25. The skin and skull were sent to Mr. Boden Kloss who has sent the skull measurements as follows:—greatest length 126 mm; basal length 106; condylo-



basal length 116; greatest length of upper sectorial 17; greatest cranial breadth 52.5; zygomatic breadth 77; least inter-orbital breadth 19.5 mm.

Both the skull and body measurements are smaller than those recorded by Blanford for Nepal, though this animal appeared to be fully mature. The colouring was as follows:—nose dirty pink; lips and pads liver brown; body and tail dark chestnut brown, the tail being white beneath. There are a few light stripes on the head, and the chin is white. Whiskers white, black basally.

It is almost certain that this is the animal known to the Siamese as the “Sena fai” or Fire-cat. Though few have seen it, it is generally alleged to be very fierce and a match for the tiger.

K. G. GAIRDNER, C.M.Z.S.

March, 1917.

### No. III. A New Bandicoot from Siam.

BY OLDFIELD THOMAS.

(Reprinted from Journ. Bombay N. H. S., XXIV, p. 642).

*Bandicota mordax*, sp. n.

Near *B. nemorivaga* but with large teeth.

Size about as in *B. nemorivaga*, or, since the type is not full grown, perhaps averaging larger. Fur of the posterior back more profusely mixed with long blackish bristles, so that the colour is consequently darker than in *nemorivaga*, and the general appearance is more like that found in the *gigantea* group. Under surface slaty grey, less broadly washed with whitish than in *nemorivaga*. Hands brown with whitish digits, feet wholly brown.

Skull apparently quite as in *nemorivaga*; supraorbital ridges not yet so developed in the type; palatal foramina narrowed posteriorly.

Molars large and heavy, their breadth markedly greater than in the allied species.

Dimensions of the type, measured in the flesh by Mr. Lyle:—Head and body 228 mm.; tail 230; hindfoot 52; ear 31. Skull:—Condylar-incisive length 55.3; zygomatic breadth 30; nasals  $21 \times 6.8$ ; interorbital breadth 7.4; breadth between ridges on parietals 12.4; palatal length 30; palatal foramina 11; upper molars series 10.8; breadth of  $m^1$  3.8.

*Hab.*—Northern Siam. Type from Chiangmai. Alt. 306 m.

*Type.*—Young adult female. B. M. No. 9.10.11.24. Original number 249. Collected 25th April 1908 and presented by Th. H. Lyle, Esq.

The breadth of the first molar in our considerable series of *B. nemorivaga* never exceeds 3.4 m.



## No. IV. A New Bat from Siam.

BY OLDFIELD THOMAS, F.R.S.

(Reprinted from Journ. F. M. S. Museum, VII, p. 1).

*Eptesicus dimissus*, sp. nov.*Eptesicus pachyotis*, Robinson & Kloss, Journ. Fed. Malay States Mus. V, p. 116 (1914).*Type.* ♀ in al. Kao Nawng, Bandon, Malay Peninsula 3,500'. June 1913. F. M. S. Mus. No. 522-13. Collected by H. C. Robinson and E. Seimund.

A medium-sized species related to *E. pachyotis*. Size rather greater than in *E. pachyotis*. Body proportionally rather larger compared with the wings. Fur short (hairs of back about 3 mm. in length), rather sparse, mostly confined to the body except on the interfemoral, on a triangle at the base of the tail. Colour chestnut brown above, lighter below, the hairs of the mesial area of the under-surface broadly tipped with dull whitish or buffy. Ears short, rather narrow, inner base with a rounded basal lobe; inner edge slightly convex, tip rounded off, outer edge straight above, convex lower down, with a low antitragal lobe. Tragus short, its inner margin, which is scarcely longer than its breadth, slightly concave, tip rounded, outer margin convex with a fleshy basal lobe. Wings to the middle of the metatarsals. A distinct post-calcareal lobule.

Skull broad and stoutly built, with a well marked occipital "helmet." Upper incisors with less disparity in size than in the allied species, the tip of the outer attaining three fourths the height of the inner, the latter rather small but still of the characteristic *Eptesicus* shape, parallel sided, bicuspid terminally; the outer tricuspid, obliquely concave. Last lower molar with its posterior portion nearly equal to the anterior part in area, and similar to it, as in most of the smaller species of the genus.

Dimensions of the type, measured on the spirit species.

Forearm, 42 mm.

Head and body, 57; tail, 39; ear, 14; tragus, length on inner edge 3, width 2-3. Third finger (epiphyses not fully ossified), metacarpus 39; first phalanx 15; lower leg and hind foot with claws, 25.5 mm.

Skull, greatest length 17.4; condyle to front of canine 15.8; basi-sinual length, 12.4; palato-sinual length, 6.3; front of canine to back of  $m^3$ , 6.2 mm.

*Habitat and Type*, as above.

This bat has been determined as *E. pachyotis* Dobs. of Assam, to which it is no doubt closely allied. But it may be distinguished by its larger size (the type being barely adult), the attachment of wing membrane to the middle of the metatarsus instead of to the base of the toes, and by its proportionally much larger outer upper incisor.



**No. V. On a New Race of *Callosciurus atrodorsalis* (Gray),  
from North Siam.**

By H. C. ROBINSON & R. C. WROUGHTON.

(Reprinted from Journ. F. M. S. Museum, VII, p. 91).

*Callosciurus atrodorsalis zimmeensis*, subsp. nov.

*Type.* Adult female (skin and skull), British Museum No. 9, 10, 11, 20. Collected at Chiengmai, North Siam, on 12th April 1908 by Mr. T. H. Lyle and presented to the National Museum. Collector's Number 245.

*Diagnosis.* A local form of *C. atrodorsalis*, in which the dorsal patch is almost obsolete and the rufous undersurface broken by a patch, coloured like the back, on the throat, chest and a narrowing area of the abdomen.

*Colour.* General colour above the usual olivaceous grizzle, the dorsal black patch almost obsolete; below the throat chest and a wedged area, extending to at least half the length of the abdomen coloured like the flanks, the remainder nearly hazel. Face like back with no trace of the bright colouring so characteristic of typical *C. a. atrodorsalis*. Hands and feet finely grizzled, at least as dark as the back. Tail rather as in *C. caniceps concolor* than in *C. atrodorsalis*, i.e., the fulvous shading of the hairs so common in the latter almost entirely absent in this form.

*Dimensions.* Extrenal dimensions of the type, taken in the flesh; head and body, 217; tail, 205; hindfoot, 49; ear, 21 mm.

Skull: Greatest length, 55; basilar length, 42; zygomatic breadth, 32; nasals 17; diastema, 12; upper-molar series, 10.6 mm.

*Remarks.* A fine series of 12 specimens, all with one exception taken between 700 and 1,000 feet in altitude, is quite constant in showing the obsolescence of the black dorsal patch and equally so in the encroachment of the dorsal colouring on the throat, chest and anterior abdomen. An individual taken at Muang Pai on the Salwin watershed shows intergradation with other forms from British Burma.

**No. VI. Occurrence of the Pied Imperial Pigeon (*Myristicivora  
bicolor*) in the Gulf of Siam.**

In March of this year three Pied Imperial Pigeons visited Koh Phai (Siamese, Koh=Island) in the Inner Gulf of Siam. They were the first birds of this species seen by me during two years residence there, or indeed in any other part of Siam, and were extremely shy and difficult to approach, as they frequented the hill-tops only. I succeeded, after a week, in obtaining a shot on the 25th March, and secured one bird which I preserved and have given to Mr. W. J. F. Williamson. The other two made off in a south-westerly direction and were not seen again. They appeared to me to fly more rapidly than









A two-headed Snake (*Homalopsis buccata*).



Nest of Hamadryad (*Naia bungarus*).



other pigeons. When freshly killed, the white portions of the plumage were of a beautiful satin-like appearance.

C. H. FORTY.

May, 1917.

[This is an interesting occurrence, as it is only the second record of this bird from Siam, and represents a considerable extension of its range. According to Mr. H. C. Robinson (Journ. F. M. S. Mus. Vol. V, p. 140) the Pied Imperial Pigeon swarms on the southern islands of the Malay Peninsula at certain seasons of the year, but he failed to meet with it during his expedition in 1913 to the mainland and islands of the district of Bandon, in Peninsular Siam, as he had evidently expected to do. Subsequently, in May 1915, H. R. H. the Prince of Chumpon saw and obtained a solitary specimen in the same part of the country as Mr. Robinson had visited—*vide* Vol. II, p. 61 of this Journal. Koh Phai, which lies in latitude 12° 55' N. and longitude 100° 35' E, is about 280 miles N. N. E. of Bandon. Eds.]

#### No. VII. A Hamadryad's Nest.

The accompanying photograph of the nest of a Hamadryad (*Naja bungarus*) which I obtained last year, may be of interest to your readers. It was found early in June in the Upper Me Ing, Muang Prayow in a clump of bamboos, close to a small stream. The nest at first sight appeared to be nothing more than an ordinary heap of leaves, as the eggs were entirely covered up and hidden from sight. For the purposes of the photograph they have been partly exposed. Altogether they were 32 in number, the young ones inside being nearly fully developed, and with the white bands upon the body showing very clearly. My men told me they had seen the parent snakes at the nest the day before, but there was no sign of them either when I arrived, or afterwards, and as far as I know they had not been killed.

H. W. JOYNSON.

Jan., 1917.

#### No. VIII. A Two-headed Snake.

Through the kindness of Mr. Lawson, I obtained last year, an interesting specimen of a common water snake (*Homalopsis buccata*) showing two well developed heads. The owner of the snake, a Siamese, who had kept it alive for some time, stated that it ate fish regularly, devouring alternately with each head. Dissection, however, showed this procedure to have been impossible, the extra head (the lower one in the photograph), although perfect in all its external characters, was merely attached to the main trunk as regards its more important anatomical structures.



If my memory serves me rightly, similar abnormalities in development have already been recorded twice for this same species.

MALCOLM SMITH.

Feb., 1917.

**No. IX. A New Frog for Bangkok.**

To the list of Batrachians for Siam, given earlier in this number of the Journal, another frog may be added to those already found in Bangkok, namely *Rana cancrivora*, making a total now of 14 species found in and about the Capital. This frog is common at Petriu, a little to the East of Bangkok, where the country is of a precisely similar nature, and its occurrence, therefore in the City, was to be expected.

MALCOLM SMITH.

April, 1917.



## PROCEEDINGS OF THE SOCIETY.

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### 4TH ANNUAL GENERAL MEETING.

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This was held at the office of the "Bangkok Times" on the 14th February, 1917, and was attended by 15 members and 2 guests.

A statement of the affairs of the Society during 1916 was read by the Hon. Secretary, from which it appeared that, after providing for the cost of all numbers of the Journal issued during the year (including No. 5 of Vol. I), there was a Bank balance on 31st December, 1916, of Tcs. 381.01, and that the total membership on that date was 77, being an increase of 4 members during the year.

The President, Mr. W. J. F. Williamson, then moved the adoption of the report and accounts, which were passed as presented.

On the proposal of Mr. L. Brewitt-Taylor, seconded by Mr. S. C. Keynes, the officers of the Society, for 1916, were re-elected *en bloc*, and on the proposal of Mr. A. J. Irwin, seconded by Mr. E. J. Godfrey, Dr. M. Smith and Mr. W. J. F. Williamson were elected Editors of the Journal.

A proposal by the President, seconded by Mr. A. J. Irwin, that Rule 9 of the Society's Rules be amended to allow authors, whose Papers were accepted for publication in the Journal, 25 copies instead of 10, was carried.

On the conclusion of the business part of the meeting, an exhibition of specimens was given by Mr. Godfrey, Dr. Smith and Mr. Williamson—the last-named also showing some of the birds collected by Mr. E. Eisenhofer in Northern Siam, which had been mentioned in the Paper by Count Nils Gyldenstolpe which appeared in Vol. I, Nos. 3 and 4, of the Journal.



## STATEMENT OF ACCOUNTS FOR 1916.

RECEIPTS.		EXPENDITURE.	
	Ticals.		Ticals.
Balance from 1915 ...	577.08	Production of Journal, Vol. I, No. 5	373.05
Subscriptions ...	1,191.33	do. Vol. II, No. 1	470.55
Donation ...	100.—	do. Vol. II, No. 2	557.43
Journals sold ...	96.50	Postage ...	75.83
Interest on balance at Bank	14.34	Printing notices, etc. ...	14.82
		Stationery ...	6.50
		Hire of room for General Meetings ...	15.—
		Bookcase ...	36.—
		Subscription to Annals and Magazine of Nat- ural History for 1916 and 1917 ...	49.06
		Balance at Bank ...	381.01
 Total	 1,979.25	 Total	 1,979.25

Bangkok,  
20th January, 1917.

(Sd.) S. H. COLE,  
*Hon. Secretary and Treasurer.*



## LIST OF MEMBERS ON 31ST DECEMBER, 1916.

Aagaard, C. J.	Laydeker, E. A.
Anusasana Paniekkarn, Luang	Lucius, Dr. med. R.
Bain, W.	Lyons, J. R. C.
Barron, P. A. R.	Macleod, G. G.
Bonnafois, H.	Massey, H. E.
Brewitt Taylor, L.	McBeth, J. J.
Butler, T. S.	Mohr, A.
Cable, J. A.	Mountain, A. W.
Cambiaso, Count F.	Nesbitt, P.
Carthew, Dr. M., M.D., D.P.H.	Nisbet, R. H.
Cole, S. H.	Nunn, W.
Collins, Mrs. D. J.	Nystrom, F.
Dalgleish, J. E.	Ogilvie, A. W.
Due-Petersen, Dr.	Pegg, H. F.
Duke, A. H.	Phongse Sanitwongse, Mom Luang
Eisenhofer, E.	Porter, A. A.
Elwes, G. F. W.	Queripel, A. L.
Eyton, S. W.	Robert, Dr. L.
Follett, C. B.	Rogers, B. H.
Forty, C. H.	Ross, D.
Gairdner, K. G., C.M.Z.S.	Sherriff, C. A.
Gayetti, Dr. C.	Slack, T. A.
Geyer, H.	Smith, E. Wyon.
Gilmore, W. M., B.A., B.A.I., F.R.G.S.	Smith, M. A., M.R.C.S., L.R.C.P.
Godfrey, E. J., B.Sc., F.E.S.	Smyth, G. C.
Graham, H.	Spigno, A. B.
Groundwater, C. L.	Sprater, Major W.
Groves, Mrs. S. P.	Seub Suk Sawat, Mom Chao
Grut, W. L.	Trotter, E. W.
Hall, R. G.	Ward, T. R. J., C.I.E., M.V.O.
Healey, E.	Webb, G. E., B.A.
Herbert, E. G., C.M.Z.S.	Weeks, W. G.
Irwin, A. J., B.A., B.A.I., A.M.I.C.E., F.R.G.S.	Weston, C. M.
Kemp, P. R.	Williamson, W. J. F., M.B.O.U.
Keynes, S. C.	Wolf, G.
Lambert, S. G.	Yates, H. C. St. J.

## HONORARY MEMBERS.

H.R.H. The Prince of Chumporn.

Baker, E. C. Stuart, F.Z.S., M.B.O.U.	Gyldenstolpe, Count Nils, B.A.
Kloss, C. Boden, F.R.G.S., F.Z.S., M.B.O.U.	
Robinson, H. C., C.M.Z.S., M.B.O.U.	







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THE  
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OF THE  
Natural History Society of Siam

Volume II.

BANGKOK.

Number 4.

ON TADPOLES FROM SIAM.

BY MALCOLM A. SMITH, M.R.C.S., F.Z.S.

WITH TWO PLATES.

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In the following paper, whilst describing some unknown tadpoles, I have taken the opportunity of reviewing many other known species, and of comparing my own observations upon them in Siam, with those of other naturalists both in this and in the neighbouring countries. I have also included some remarks upon the breeding habits of their parents. With two exceptions, *Rana kuhlii* and *R. cancrivora*, I have been able to keep and watch the development of all the species referred to.

I have never experienced the difficulty, which some seem to have had, in transporting certain tadpoles, in particular those of the genus *Microhyla*. The Engystomatid larvae are certainly more delicate than those with the Ranid type of mouth, but by taking precautions to



prevent their being "cooked" in the sun, and by not overcrowding them in their conveyance, I have always managed to bring most of them safely home. They have even survived a 200-kilometre journey by rail.

This year I succeeded, where I had hardly expected to, in bringing down the tadpoles of *Megalophrys montana* from the cool, fresh, mountain streams in the North, to the sultry plain of Bangkok. This was a three days journey, chiefly by train, and at almost the hottest time of the year. They travelled in an ordinary, large-mouthed, glass jar, provided with a string handle and thickly padded at the sides and below with straw or sacking. By keeping this always wet, the evaporation prevents the water inside from getting too warm, whilst the padding below helps to lessen the vibration when in the train.

The amount of knocking about that many of the tadpoles with the Ranid type of mouth will stand is quite remarkable, considering how soft all their structures are. I have seen them dropped off verandahs from a considerable height, jolted about in bullock-carts, and, worst of all, tossed on the backs of elephants for days together, yet most of them survived and seemed none the worse for it.

The literature quoted with each species refers to the tadpole only.

### ***Rana kuhlii* Dum. & Bib.**

I found this frog exceedingly common upon Doi Nga Chang, N. Siam, haunting the streams, and hiding by day beneath the stones in the water. I have obtained it also on the hills south of Prae, but the elevation there is not so great, and it appears to be far less common.

#### DESCRIPTION OF THE TADPOLE.

*Head and body.* Length  $1\frac{1}{2}$  times its breadth, considerably flattened both above and below, snout rounded. Nostrils midway between the tip of the snout and the eyes. Eyes about  $1\frac{1}{2}$  times as far apart as the nostrils, looking as much upwards as outwards, the portion of the head visible on their outer sides when viewed from above equal to half the interocular space. Spiraculum sinistral, nearer the eye than the vent, not prominent in life. Anus dextral.

*Tail.* Four times as long as deep, tip bluntly pointed, crests.

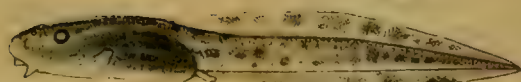




3b.



1b.



1.



2.



2a.



1a.



3a.



3.

1. *Rana kuhli*. 2. *Rana rugulosa*. 3. *Rana macrodactyla*.







rather low, upper a little deeper than lower, not extending on to the back.

*Mouth.* Small, on the ventral surface; shortish papillae at the sides and below. Beak broadly edged with black. Upper lip with a long, continuous row of teeth, followed by a second, broadly interrupted. Lower lip with three continuous rows, or the upper one narrowly interrupted; the lowest row about half the length of the first or second, which are subequal.

*Dimensions.* Total length, 45; head and body, 16; depth of tail, 7 mm.

*Colour (in life).* Olive above speckled with blackish, below nearly colourless (in spirit, whitish).

Numbers of these tadpoles in all stages of development, and young ones which had left the water, were obtained upon Doi Nga Chang early in March, at between 700 and 1,000 metres elevation. In company with them were the larvae of *Megalophrys montana* and *M. polodytoides*.

### ***Rana rugulosa* Wieg.**

*Rana tigrina*, Flower, P.Z.S., 1899, p. 892, pl. LIX.

*Rana rugulosa*, Annandale, Mem. Asiat. Soc. Bengal, VI, p. 126, fig. 2 and pl. VI (1917).

I have obtained two distinct forms of this tadpole in Bangkok, one with a long snout and elongated body, the other with a shorter snout and more rounded body. This variation is quite independent of age, and the figures given, showing the difference, have been drawn from fully grown examples. Flower's illustration is evidently from the shorter form, where the length of the body is about  $1\frac{1}{2}$  times its width. In the longer form it may be nearly twice its width. A somewhat similar difference in form has been figured by Annandale for the tadpole of the closely allied *R. tigrina*, showing the variation in the position of the nostril. It will be observed that the position of the nostril with regard to the eye does not alter, the variation being in the length of the snout beyond, the greater portion of which, being absorbed in the completion of development, has no anatomical value in after life.

Concerning the armature of the mouth Flower remarks (p. 893), "inside the upper lip are five series of fine, black teeth: the first



series is uninterrupted, the second slightly interrupted by the individual teeth being 'grouped with intervals' about the centre of the line; the remaining series are broadly interrupted." In nearly all the specimens which I have examined the second series is also uninterrupted, and I believe the normal dental formula for the upper lip to be  $2:3+3$  and not  $1:4+4$ . Where I have seen the second row interrupted in the manner apparently referred to by Flower, it has been due to erosion of the teeth at that point, a not unlikely thing to happen in a creature of such active habits.

The tadpole may attain a size considerably larger than he mentions, and specimens of 65-70 mm. in total length, with a head and body of 25, are not uncommon.

I have obtained them throughout the rainy season between July and October, from pools and ponds where the water is usually fairly deep. They are predacious, and like their parents, that will readily devour other frogs, feed for choice, at any rate in captivity, upon other tadpoles. A really hungry individual will bolt its victim whole, but the more usual method is to seize its prey by the belly, catching it from below, and then to suck out the abdominal contents, after which the body is dropped. In this way a well grown tadpole will dispose of ten to fifteen others, the size of *Microhyla ornata*, in the course of a day.

### ***Rana cancrivora* Gravenh.**

*Rana tigrina*, var. *angustopalmata*, van Kampen, Webers Zoolog. Ergebn., Bd. IV, p. 389 (1907).

*Rana tigrina*, id., Natuurk. Tijdsch. Ned.-Ind. LXIX, p. 33 (1909).

*Rana cancrivora*, Annandale, Mem Asiat. Soc. Bengal, VI, p. 128 (1917).

To Dr. Annandale belongs the credit for having at last assigned this frog its true place in scientific literature; and it was a great pleasure to me to obtain the larvae so soon after the publication of his article, and to compare them with Van Kampen's description of Java specimens.

Mine were collected near the mouth of Chumpon River (Pen. Siam), where this frog was very common, and from Koh Lak, a little further north, at the end of June. Some of them, with their tails still incompletely absorbed, had just left the water, and it is from these that the diagnosis has been made.



The only important point in which my specimens differ from Van Kampen's is in the length of the third or lowest series of teeth in the lower lip. He states that this row is much shorter than the one above—the length of the interval without the papillae; in mine, however, it is nearly as long as the one above and at least three times as long as the interval without papillae. In colouration they agree very well, but mine have a proportionately shorter tail.

Total length, 37 ; head and body, 15 mm.

### ***Rana limnocharis* Wiegman.**

Van Kampen, *Natuurk. Tijdsch. Ned.-Ind.*, LXIX, p. 35 (1909) ;  
Smith, *Journ. Nat. Hist. Soc. Siam*, II, p. 165 (1916); Annandale,  
*Mem. Asiat. Soc. Bengal*, VI, p. 133, fig. 2 and pl. VI (1917).

I have obtained the tadpoles of this frog in February (the middle of the dry season), as well as throughout the rains from July to November. Annandale has figured the mouth-parts from a specimen obtained in Madras. It differs from the Siamese form, and also that of Java (*vide* Van Kampen) in that the papillae are complete along the under lip. In all the specimens that I have examined there is a well marked gap or space in the middle, devoid of papillae.

### ***Rana macrodactyla* (Günther).**

This frog inhabits the padi-fields and swampy places in and around Bangkok, and for some reason has a curiously local distribution. I know of some half dozen spots from where I can obtain as many specimens as I wish, but the rest of the country, although not differing apparently in any way, seems to be entirely devoid of them.

#### DESCRIPTION OF THE TADPOLE.

*Head and body.* Length twice its breadth, somewhat flattened both above and below, snout rounded. Nostrils nearer the tip of the snout than the eyes. Eyes looking almost entirely outwards, hardly any of the head visible on their outer sides when viewed from above; twice as far apart as the nostrils. Spiraculum sinistral, equidistant between the eye and the vent, long and prominent in life. Anus dextral.

*Tail.* Three and a half times as long as deep, tip pointed. Crests moderate, upper  $1\frac{1}{2}$  to 2 times the depth of the lower, not extending on to the back.

*Mouth.* On the ventral surface. Beak narrowly edged with



black. Lips with short papillae at the sides and long ones below. Teeth feebly developed; one long uninterrupted series above; two below, the upper narrowly interrupted, the lower short, less than half the length of the one above.

*Dimensions.* Total length, 33 mm., head and body 11. Depth of tail 6.

*Colour* (in life). Reddish, brownish or olivaceous, thickly speckled, the markings on the tail sometimes forming vertical bars; a darkish mark down the middle of the back and another along each side of the body. Belly golden, throat blackish, with white spots. The white longitudinal lines of the perfect frog may be present before the creature leaves the water. The tadpole closely resembles that of *R. erythraea*. It may be distinguished by its smaller size and by the disposition of the teeth in the lower lip. In *R. macrodactyla* the upper row is interrupted, and the lower one very short. In *R. erythraea* the upper row is usually continuous and the lower one nearly as long as the upper.

I have obtained the tadpoles of *R. macrodactyla* in June and July shortly after the monsoon has broken, and they would probably be found as long as there is water in the fields. They are very active creatures and usually seek to avoid capture by concealing themselves in the mud.

### ***Rana lateralis* Bouleng.**

This frog has been found in several localities in both Central and Eastern Siam, and I have obtained the tadpoles at Nong P'ling and Ta Rua (C. Siam) in July and August. They were found in deep pools of water.

#### DESCRIPTION OF THE TADPOLE.

*Head and body.* Length about  $1\frac{1}{2}$  times its breadth, slightly flattened above, full and convex below, snout rounded; nostrils distinctly nearer the tip of the snout than the eyes. Eyes almost entirely upon the sides of the head, looking only very slightly upwards,  $2\frac{1}{2}$  times as far apart as the nostrils. Spiraculum sinistral, short, not prominent in life, nearer the eye than the vent. Anus dextral.

*Tail.* Three and a half times as long as deep, obtusely pointed; crests full but narrowing rapidly before the tip of the tail is reached:



upper one considerably deeper than the lower, not extending on to the back.

*Mouth.* On the ventral surface. Beak edged with black; a single row of short papillae at the sides, a double row of longer ones below. Upper lip with a long, continuous row of teeth, and a second broadly interrupted by the beak. Below, three rows, first and second of about equal length, the uppermost usually narrowly interrupted, the lowest, three quarters the length of the upper ones.

*Colour* (in life). Brownish or olivaceous, spotted and marbled with darker. Below white, the throat usually with dark marblings.

*Dimensions.* Total length, 55 mm.; head and body, 20; depth of tail, 10.

The tadpole is very similar to that of *R. nigrovittata* (Blyth), but is of larger and stouter build, and with the lowest series of teeth in the lower lip shorter.

Many of the young on leaving the water have a strong tinge of pink upon the back and limbs above.

### ***Rana erythræa* (Schleg.).**

Van Kampen, Webers Zoolog. Ergebn., Bd. IV, p. 390 (1907); id. Natuurk. Tijdsch. Ned.-Ind., LXIX, p. 35 (1909).

Except for some differences in colouration, examples from Bangkok agree entirely with Van Kampen's description of those from Batavia.

My specimens were greenish brown or brown above, speckled with darker, and with a dark mark running through the eye and along the flank to the base of the tail. Sides below marbled with olive, muscular portion of tail light brown, crests colourless except for a dappling of reddish. Belly yellowish white, speckled with red, throat brown. A light vertebral line and another along the lateral fold on either side may be present in the fully grown tadpole. The vivid green of the back of adult is not seen until the frog is at least one-third grown.

### ***Rhacophorus leucomystax* (Gravenh.).**

Flower, P. Z. S., 1896, p. 906, pl. XLIV; id. 1899, p. 899, pl. LIX; van Kampen, Webers Zoolog. Ergebn., Bd. IV, p. 400 (1907); id. Natuurk. Tijdsch. Ned.-Ind., LXIX, p. 42 (1909).

The common tree-frog of Siam and the Malay Peninsula breeds



in Bangkok chiefly in artificial collections of water, such as in the large jars used by the Siamese for growing lotuses, or in the open tanks where rain-water is stored for use. Being thus independent of rainfall, the larvae may be found throughout the year.

Flower has described the Bangkok specimens as having five series of teeth in the upper lip, whilst the Malayan form has only four. Both forms, however, are to be found in this country, and are equally common. Similarly, the upper series of teeth in the lower lip may be continuous or narrowly interrupted. The yellow spot on the tip of the nose is present in all Siamese individuals, and is usually very conspicuous in life. I have seen it in specimens from as far south as Patani.

A batch that I obtained last August from Prabat, differed in colour from all the specimens that I have seen before, in that the upper part of the head and body was of a dark uniform grey, and there was a broad vertical band of the same colour near the end of the tail. Some others obtained at Ta Rua, a few miles distant, at the same time, were of normal colouration.

### ***Microhyla ornata* Bouleng.**

Flower, P.Z.S., 1899, p. 902, pl. LX.

By far and away the commonest of the *Microhyla* tadpoles in Bangkok. They may be found in almost every suitable deposit of water, and at any time of the year, except perhaps in April and May at the end of the dry season.

Flower's specimens measured 20 mm. in total length, and that is usual for full grown ones. I obtained some from Koh Lak (Pen. Siam) last year, however, which measured 29 mm. in length, head and body 10. The tail, as a rule, is deeper than he has figured it.

### ***Microhyla butleri* Bouleng.**

"Transparent tadpoles", Flower, P.Z.S., 1899, p. 903, pl. LX, fig. 2.

Anandale has recently suggested\* that Flower's "transparent tadpoles" from Penang, are probably those of *M. berdmorei*. He may be right, as the larva of this frog is still unknown, but tadpoles that I have bred out on several occasions and which agree entirely with Flower's description, belong to *M. butleri*. Most of the Siamese speci-

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\* Mem. Asiat. Soc. Bengal, VI, p. 151 (1917).



mens that I have seen, have scarlet or reddish brown upon the tail, as Annandale found with some of those that he obtained.

*M. butleri* is common in many parts of Siam, both at sea level and upon the hills. I have not yet obtained it at any great elevation.

My tadpoles are from Ta Rua and Nong Pling (C. Siam), where they are plentiful during July and August. They inhabit the deep pools that have been made by the excavation of earth to form the railway embankment.

None of those that I have kept have ever attained the size of those developing under natural conditions, and in all of them also, a distinct diminution in the brilliance of their colouration has taken place while in captivity.

Upon the gregarious habits of this tadpole, Annandale has already remarked, and it seems to be a family trait, for I have observed it in other species belonging to this genus.

### **Glyphoglossus molossus** Gunth.

I have obtained the tadpole of this species also at Nong Pling and Ta Rua in the months of July and August, and at Koh Lak in the Peninsula, in February. They were found in ponds where the water was of considerable depth.

#### DESCRIPTION OF THE TADPOLE.

*Head and body.* Length one and one-third times its breadth, snout broadly rounded. Nostrils midway between the eyes and the tip of the snout. Eyes perfectly lateral, four to five times as far apart as the nostrils. Spiraculum median, the opening below the centre of the coil of gut. Anal tube long and curved, opening in the mid-line.

*Tail.* Four to five times as long as deep, ending in a fine point. Membranes shallow, almost straight, upper one, half the depth of the lower, barely reaching to the back.

*Mouth.* Simple, consisting of a nearly straight upper lip and a contractile lower one, which forms a vertical slit when closed.

*Colour* (in life). Pale greenish, greyish or brownish, more or less translucent, sometimes almost colourless. Some dark patches of pigment, in the mid-line, around the nostrils, between the eyes, and at the base of the tail. Posterior part of tail often dark grey or blackish.



*Dimensions.* Very variable; well grown individuals are :—total length, 40; head and body, 12; depth of tail, 6 mm.

The young on leaving the water are very variable in colour; greenish, greyish or brownish, sometimes with regular markings upon the back. The large metatarsal tubercle is fully developed, and the lower jaw is thickened, but the peculiar truncate formation of the snout takes some weeks to develop.

In general characters, and in its peculiar translucency of colouration, this tadpole closely resembles certain of the *Microhyla* larvae, and except for its narrower and longer tail, is practically indistinguishable from them. In life, however, it may be easily recognised by the peculiar position which it assumes in the water. It has the same habit of "floating" quietly about just below the surface, but whereas all the *Microhyla* tadpoles that I know of lie in a horizontal position, *Glyptoglossus molossus* assumes an oblique one. The obliquity may not be great, but in fully grown individuals it is often very marked, and I have seen them almost perpendicular. Usually they lie at about an angle of  $45^{\circ}$  with the surface of the water.

Like the *Microhyla* larvae also, they are sociable, and are generally to be seen in shoals. Some of these assemblies are very large, and must be composed of many thousands of individuals, all closely packed together with their heads turned in the same direction.

The spawn is laid in masses, and floats on the surface of the water. Breeding commences at Ta Rua and Nong Pling at the end of May or in June, as soon in fact as there is sufficient water to permit of it. As the ponds in these localities are entirely dry from about November to May, they obviously cannot spawn there during those months, and I was somewhat surprised, therefore, to have larvae sent me from Koh Lak in February, where the rainfall is practically the same.

### ***Calluella guttulata* (Blyth).**

Except that it grows to a larger size, and appears to have the tip of its tail always black, the tadpole of this species is indistinguishable from that of *Glyptoglossus molossus*; and I have always found them together, in the same ponds and at the same time of the year. They assume the same oblique position in the water.



*Dimensions.* Total length 50-57 mm. ; head and body, 16.

***Megalophrys montana* Kuhl.**

Max Weber, Ann. Jardin Bot. Buitenzorg, Supp. II, p. 5 (1898) ; Laidlaw, P. Z. S., 1900, p. 889 ; Gadow, Amphibia and Reptiles (Cambridge Nat. Hist.) pp. 59, (1901) ; Bouleng., Fascic. Malay., Zool., I, p. 132 (1903) ; Annandale, Fascic. Malay., Zool., Pt. II, p. 275 (1903) ; id. Rec. Ind. Mus., VIII, p. 30 (1912) ; id. Mem. As. Soc. Bengal, VI, p. 154, pl. VI (1917) ; Van Kampen, Webers Zoolog. Ergebn., Bd. IV p. 409 (1907) ; id. Natuur. Tijdsch. Ned.-Ind., LXIX, p. 27 (1903).

This species is widely distributed throughout Siam, and I have obtained the tadpoles on many of the hills. At the end of February this year I found them in plenty on Doi Nga Chang (N. Siam), at about 1000 metres, and not only had I abundant opportunities of observing them there under natural conditions, but also succeeded in bringing some living specimens down to Bangkok and keeping them until their metamorphosis was completed.

The amount of discussion which has centred round the function of the curious mouth of this tadpole, can be judged from the literature quoted above, and as my observations extended over a considerable period, I have added them to those already recorded by other naturalists. They were made almost daily for nearly four months.

The conclusion that I came to with regard to the "funnel" was, that its chief, and possibly its sole, function, was to enable the creature to obtain its food, much in the same way as the membranous lip of the tadpole of *Microhyli achatina*, which I described in a previous number of this Journal (*antea* p. 37).

Watching them feed in their native pools, one could see the "funnel" pulsating with the sucking action set up by the creature, and one could see too how all small particles of matter floating down the stream, that happened to come within range of the current thus set up, were drawn towards the mouth and swallowed. And no doubt many other minute particles, not visible to the naked eye, were devoured in this way. The same performance could be demonstrated in captivity, by shaking the dust of decaying vegetable matter upon the water where they were feeding. The so-called "teeth" appeared to act as a filter, by holding up particles that were too large for assimilation. Every now and again the creature would reverse its sucking action, and spit away these undesirable fragments.



Both in their natural habitat, and in captivity, they showed a marked predilection for shallow water. The streams where I found them were small and fairly swift, but it was in the quiet puddles here and there that they usually congregated and could be observed feeding. Those that I kept spent most of their time on the top of bricks placed in their tank, where the water was never more than one centimetre deep. Hidden there beneath the leaf of some aquatic plant, they would poke their "funnel" round the edge and so feed. I saw the same thing happen under natural conditions. Sometimes they lay quite still, with the "funnel" expanded on the surface of the water, but not feeding.

Although when first caught and kept in a jar, they often assumed the vertical attitude as figured by Gadow, I seldom saw them in that position when placed in their permanent abode. Nor did I often see them so in nature. Even when feeding in deeper water, their bodies were usually kept in a more or less horizontal plane.

That the funnel acts as a float, and is of assistance in that way to the creature whilst feeding, is evident, but that its function ever can be to enable its owner to float away upon flood water into safety, as has been suggested, I doubt very strongly. Certainly, at the first signs of disturbance in the water, mine in captivity invariably curled up their floats and sank to the bottom. I never saw mine use the "funnel" as a rasp, as Van Kampen has remarked, and they fed so persistently at the surface, that I imagine this to be the usual method of obtaining food. I quite agree with Annandale with regard to the muscular action of the structure.

Of the six individuals which I succeeded in bringing home, only two completed their development; one at the end of May, and the other a month later. The absorption of the "funnel" took place concurrently with the absorption of the tail, and occupied about ten days. When it was practically completed, the creature left the water.

### ***Megalophrys pelodytoides* Bouleng.**

I obtained the tadpole of this species early in March on Doi Nga Chang at about 1,000 metres elevation, together with a few adult specimens. At this height the larvae were quite common, but as one descended the hill, they became less numerous, and below 400 metres were not seen at all. Some ten individuals that I brought down with

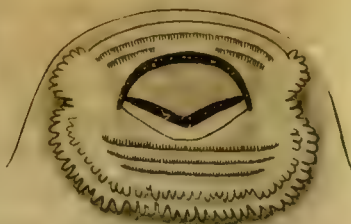




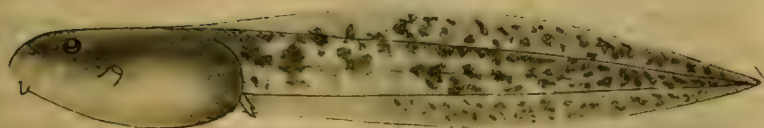
1.



3b.



1b.



3.



2a.



1a.



3a.



2.







me to Bangkok finally completed their metamorphosis, and I was thus able to confirm the identification.

#### DESCRIPTION OF THE TADPOLE.

*Head and body.* Length  $1\frac{3}{4}$  to 2 times its breadth, much flattened above; snout broadly rounded. Nostrils a little nearer the tip of the snout than the eyes; nearly as far apart as the eyes. Eyes looking upwards and outwards, the portion of head visible on their outer sides when viewed from above equal to one quarter the interocular space. Spiracle on the left side, much nearer the eye than the vent, not prominent in life. Anus dextral.

*Mouth.* On the ventral surface, entirely surrounded with a lip fringed with papillae. Beak entirely black, with coarsely serrated edges. Upper lip with five or six series of teeth, the first very short, the second long and narrowly interrupted, the remaining three or four broadly interrupted, the last poorly developed and often absent; lower lip with four series also, the lowermost one not interrupted.

*Tail.* Twice as long as the head and body, four to five times as long as deep, tip bluntly pointed; crests low, subequal, the upper not extending on to the back.

*Colour (in life).* Light or dark brown, speckled and spotted with black, below greyish, uniform.

*Size.* Very variable. A well grown specimen measured:—total length, 63; head and body, 21; depth of tail, 10 mm.

The lip surrounding the mouth serves also as an adhesive disc.

It has been long known to herpetologists, that the tadpoles of the genus *Megalophrys* form two very distinct groups, one with the "funnel" formation of mouth, the other of Ranid type with horny beak and teeth. In this first group five species are now known,\* whilst in the latter only one has so far been discovered, namely *M. hasseltii*. It is of particular interest, therefore, to be able to record a second.†

In general characters these two tadpoles are alike, and on my visit to the hill I found them both inhabiting the same stream. But

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\* Annandale, Mem. Asiat. Soc. Bengal, VI, p. 155 (1917).

† Another point of difference which so far appears to be constant between the two groups, is in the position of the anus. In the funnel-mouthed form this is median, in the other, dextral.



while *M. pelodytoides* was at a higher level, where the water was shallow and the current swift, *M. hasseltii* lived lower down, in deep pools of nearly still water. The fat, rounded, body of this latter tadpole was in marked contrast to the flattened shape of the former that lived continually in running water.

Those which I brought to Bangkok seemed in no way inconvenienced by the higher temperature. They fed freely upon both animal and vegetable matter, but their development was slow, as has already been remarked with the tadpoles of this genus. Judging from their rate of growth I should imagine it was not complete under about five or six months. Even after the fore-limbs had appeared, no apparent reduction in the size of the tail took place for many days, and it was at least two weeks later before the creature left the water. Like *M. hasseltii* too, which I have reared, the young ones evinced little or no desire to feed, and did not survive many weeks.

### ***Megalophrys hasseltii* (Tschudi).**

*Leptobrachium hasseltii*, Blgr., P.Z.S. 1890, p. 37; Butler, Journ. N. H. S. Bombay, XV, p. 397 (1904); van Kampen, (?) in Webers Zoolog. Ergebn., Bd. IV, p. 408 (1907).

*Megalophrys hasseltii*, van Kampen, Natuurk. Tijdsch. Ned.-Ind., LXIX, p. 27, pl. II (1909); Annandale, Mem. As. Soc. Bengal, VI, p. 153, pl. VI (1917).

This species appears to be found upon most of the hills in northern Siam and along the western boundary, and I have obtained the tadpoles in January, April and July. They have always been found in deep pools where the water is comparatively sluggish.

Annandale has recently described the three different colour varieties of this tadpole, and all my specimens (which are from the North) agree with his var. B., from the Dawna hills in Tenasserim.

### ***Bufo melanosticus* Schneid.**

Flower, P. Z. S., 1896, p. 911, pl. XLIV, fig. 3; Van Kampen, Natuurk. Tijdsch. Ned.-Ind., LXIX, p. 29.

Van Kampen states that the common Asiatic toad breeds throughout the year in Java, and the same may be said of those in Bangkok. A special increase of sexual activity, however, appears to take place in November with the advent of the dry, cool weather; and at that time numbers of them may be found congregated together, in the



same way as with *B. vulgaris* in Europe. The disproportion between the sexes does not seem to be so great, as I have never seen more than two or three males to one female.

The males may be heard calling on almost any night in the year, but whether for the mere pleasure of hearing their own voices, or for sexual purposes, I cannot say. The clear, moonlight nights of the dry months appear to stimulate them to special effort. They continue to call throughout the entire night, and if the sky is overcast, sometimes until quite a late hour in the morning.

I have nothing to add to Flower's description of the tadpole.



DESCRIPTIONS OF A NEW SNAKE AND A NEW FROG FROM SIAM.

By MALCOLM A. SMITH, M.R.C.S., F.Z.S.

*Simotes longicauda joysoni*, subsp. nov.

Bodily configuration as in *S. cyclurus*. Nasal divided; portion of rostral visible above as long as its distance from the frontal; internasal suture slightly shorter than interpraefrontal suture; frontal longer than its distance to the end of the snout, as long as the parietals; loreal slightly longer than deep: 1 prae- and 2 postoculars; temporals 1+2 (or 1+1+2, anterior very small): 8 supralabials, 4th and 5th bordering the eye; 5 infralabials in contact with the chin-shields, the anterior pair of which are twice as large as the posterior.

Scales smooth, in 17 rows in the anterior part of the body, diminishing to 15 by fusion of the 4th and 5th rows above the ventrals shortly after mid-body is passed, and continued so to the vent. Ventrals 190, slightly angulate laterally, anal entire, subcaudals 47.

*Colour* (in spirits). Purplish-brown above, with ill-defined and broken-up black cross-bands, every alternate one of which is enlarged across the dorsum into a blotch. About 50 of these blotches upon the body and tail. Below yellowish white, with large black quadrangular spots which are mostly confined to the sides. Head markings similar to *S. cyclurus*, namely, a large dark-brown crescentic band in front, passing across the praefrontals and through the eyes, an oblique temporal streak, and a narrow **A** shaped mark on the nape, its apex on the frontal.

Total length, 760 mm.; tail 105.

*Dentition*. Maxillary teeth 12, steadily increasing in size from before backwards; palatine, 7; pterygoid, 14.

*Type*. Adult male, author's number 1.116, collected in the valley of the Maa Yome, Muang Ngow, N. Siam, in June 1917, by Mr. H. W. Joyson, after whom I have named it.

A second specimen was obtained by him a few days later, and although there are differences in colour between the two, on lepidosis it must be referred to the same species.



It is also a male, and differs from the type in the following particulars :—

Frontal shorter than the parietals, a subocular between the 3rd and 4th supralabials, 7 supralabials on the left side due to fusion of the 2nd and 3rd. Ventrals, 187; sub-caudals, 50.

*Colour.* Light brown above, the dorsal blotches hardly enlarged at all. Below, uniform yellowish-white.

*Dentition.* Maxillary, 11; palatine, 7; pterygoid, 14.<sup>1</sup>

Total length, 670 mm., tail 100. Author's number, 2.119.

The type of *Sinotes longicauda* is from the Man-Son mountains, Tonkin. I have not been able to compare my specimens with it, but in lepidosis they agree so closely with the description, that they must be referred to that species. Their colouration, however, is quite distinctive, and entitles them to subspecific rank.

As Mr. Boulenger's description<sup>2</sup> is probably not available to many members of this Society, I have given a detailed account of my own specimens. They will be presented to the British Museum.

### ***Rana cubitalis*, sp. nov.**

*Diagnosis.* Glandular lateral fold narrow and prominent, toes nearly entirely webbed, the tips with small but well developed discs. The tibio-tarsal articulation reaches beyond the tip of the snout.

Nearest perhaps to *Rana guentheri* Boulenger, from which it differs in the position of the vomerine teeth, in the narrower and more prominent glandular lateral fold, in the longer hind limb, and in the larger terminal expansions to the toes.

*Description.* Vomerine teeth in two oblique groups between the choanae and extending posteriorly slightly beyond them, the interval between the groups equal to their distance from the choanae. Head longer than broad, snout as long as the orbit, obtusely pointed, canthus rostralis distinct, loreal region oblique and concave, nostrils distinctly nearer the tip of the snout than the eye, interorbital space equal to or a little narrower than upper eyelid, tympanum very distinct, nearly as large as the eye. Fingers and toes moderate, first finger considerably longer than second, toes nearly entirely webbed, tips of fingers

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<sup>1</sup> Dentition of the left side only, in each case.

<sup>2</sup> Ann. & Mag. Nat. Hist. (7) XII, p. 350 (1903).



and toes dilated into small but well developed discs. Subarticular tubercles well marked, a small, oval inner, and a small but quite distinct rounded, outer, metatarsal tubercle. The tibio-tarsal articulation reaches beyond the tip of the snout, the heels overlap when the knee is fully flexed. Skin coarsely granular above, very coarsely granular upon the sides. A narrow and very prominent glandular dorso-lateral fold.

Males with external vocal vesicles and a large rounded gland on the inner side of the elbow.

*Colour.* Light clive (greyish in alcohol) above and on the sides, with an irregular chain of small black spots along each flank. Limbs with dark cross-bars, thighs behind marbled with dark brown. Below whitish. A dark streak along the canthus rostralis, and dark spots upon the lips. Tympanum dark brown.

*Type locality.* Doi Nga Chang, N. Siam. Type and para-type, adult males. Author's numbers, 1.106 and 2.107 respectively. Collected on the banks of a small stream, February, 1917, at about 500 metres elevation.

Dimensions in millimetres.

	Type	Para-type.
Snout to vent.....	68	66
Length of head (tympanum to end of snout) ...	23	23
Breadth of head.....	21	19.5
Snout.....	9.5	9.5
Eye.....	7	7
Tympanum.....	6	6
Elbow to tip of 3rd finger.....	31	25
Tibio-tarsal articulation to tip of 4th toe.....	53	50

The type will be presented to the British Museum.



## ON A NEW MURINE GENUS AND SPECIES FROM SIAM.

By C. BODEN KLOSS, F. Z. S.

**Tautatus**, genus nov.

Skull with superficial resemblance to *Mus* but the rostrum shallower and no masseteric knobs at the anterior bases of the zygomatic plates. No raised supraorbital ridges, the edges even more rounded than in *Mus*. Palatal foramina long, extending posteriorly well between the first molars; palate extending beyond the posterior extremities of the last molars. Mesopterygoid space normal, slightly diverging posteriorly. Bullae of medium size.

Incisors with no trace of a notch in the bevelled edge. Upper molars with proportions as in *Mus*,  $m^1$  being longer than  $m^2$  and  $m^3$  combined. Laminae of  $m^1$  less distorted, the inner tubercles less posteriorly situated. The remaining molars of more angular outline: the anterior edge of  $m^2$  straighter, owing to the more advanced position of the antero-internal tubercle; the internal edge short and followed by an oblique postero-internal edge almost concave: antero-internal point of  $m^3$  forming the apex of a markedly triangular tooth.

External characters apparently not peculiar: fur dense, rather long and stiff, but not mixed with flattened spines. Hindfoot with fifth toe reaching to the middle of the basal phalanx of the fourth. Only the pollex with a flat nail. Ears of medium size. (The number of mammae and plantar pads cannot be ascertained).

The place of this genus in the synopsis for a few of the Indian Muridæ given by Thomas (in Journ. Bombay Nat. Hist. Soc., XXIII, p. 415) would be after *Mus* as follows, presuming 6 plantar pads:—

*b* 5 Bevelled edge of incisors not notched.

No frontal ridges.

*a* 6 Palatal foramina shorter. Masseteric  
knobs present     ...     ...     ... *Cealomys*.

*b* 6 Palatal foramina longer. Masseteric  
knobs absent     ...     ...     ... *Tautatus*.



Genotype : *Tautatus thai*, sp. nov.

*Type* (and only specimen examined). Female, young adult (skin and skull). Collected at Raheng in February 1917, by Mr. K. G. Gairdner. Author's number 2616/C.B.K.

*Diagnosis.* Base of upper fur deep neutral grey : pelage of two kinds :—longer hairs (9 mm.) with long dark tips, and shorter hairs (6 mm.) with very short dark tips and broad subterminal annulations of ochraceous-tawny ; the general colour effect being a grizzle of ochraceous-tawny and dark brown, the latter most marked on the back.

Entire underparts of head, body and limbs, together with the region of the vibrissae and sides of throat and neck, clad with hair having grey bases and white tips, producing an effect of silvery white, clearly margined. Forelimbs grey above : hands and feet clear white. Inner sides of ears sparsely clad with greyish hair, backs with proectote ochraceous-tawny. Vibrissae black and white. Tail blackish above and clad with dark hairs, below pale and clad with whitish hairs : at mid-length 22 rings to the centimetre.

Cranium globose ; rostrum only very slightly convex ; nasals rather pointed posteriorly and, viewed in profile, slightly concave ; palatal foramina narrowed posteriorly and reaching a line joining the antero-internal tubercles of  $m^1$  ; bullae not flattened at all.

*Measurements.* Head and body, 64 ; tail, 72 ; hindfoot, s. u., 17.5 ; ear, 12.5.

Skull :—greatest length, 20.9 ; condylo-basilar length, 18.5 ; basilar length, 16.9 ; palatilar length, 9.5 ; length of palatal foramina, 4.5 ; diastema, 5.2 ; upper molar row (alveoli), 4.0 ; greatest length of nasals, 7.0 ; combined breadth of nasals, 2.1 ; depth of rostrum between extremity of nasals and posterior alveolar edge of incisor, 2.5 ; interorbital constriction, 3.8 ; greatest cranial breadth, 10.0 ; zygomatic breadth (approximate), 10.8.

*Remarks.* Whether this animal is the same as *Mus nitidulus* Blyth,\* it is impossible to say at present as the type has disappeared and no other specimens have been obtained : though the colouring was apparently very similar it was a larger animal with the tail equal in

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\* Journ. Asiat. Soc. Bengal, XXVIII, p. 294.



length to the head and body (82 mm.).

The present individual has skull measurements which are practically those of the type of *Mus viculorum* Anderson,\* from the Kakhyen Hills near Bhamo, which Thomas in 1881 regarded (together with *Mus kakhyensis* Anderson, from the same district †) as synonymous with *Mus urbanus* Hodgson, the Indian form of *Mus musculus*: it is rather smaller than the type of *kakhyensis* but has apparently the same silvery underparts, though otherwise differing in colour from it and also from *viculorum*.

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\* Anat and Zool. Researches in Yunnan, p. 308.

† op. cit., p. 307.



## ON FIVE NEW MAMMALS FROM SIAM.

BY C. BODEN KLOSS, F. Z. S.

1. *Pachyura malayana*, sp. nov.

*Type* (and only specimen examined). Adult female in alcohol. Obtained at Bang Nara, Patani, Peninsular Siam, July 1916, by Messrs. Williamson and Smith's collectors. Author's number 2603/C. B. K.

*Diagnosis.* Colour, as viewed with the head of the specimen pointing to the left and the light falling from the front, above bistre (Ridgway), below hair-brown; in some lights distinctly greyish beneath as the hairs have palè glistening tips.

Scattered over the body and hind limbs are a number of long pale hairs like those which occur on the tail; a small patch of adpressed hairs on the sides; tail regularly tapering, dark above and thickly clad with very short hairs, paler below; hindfeet darker and less naked than the forefeet; ears scantily clad with very short hairs.

*Measurements.* Head and body, 43; tail, 25; hind-foot, s. u., 7.1; ear, 6. Skull (cranium damaged): palatal length, 5.0; upper tooth-row from front of incisors, 5.6; lachrymal breadth of rostrum, 2.4; greatest breadth of rostrum, 4.1; tip of incisors to posterior extremity of mandible, 8.6; mandibular tooth-row, 5.3.

*Remarks.* This is one of the smallest of mammals and the first example of a pygmy shrew of the genus *Pachyura* that has been met with in the Malay Peninsula.

A female from Amherst, Tenasserim, was described and named by Blyth in 1855 (*Sorex nudipes*, Journ. Asiat. Soc. Bengal, xxiv, p. 34) and quite recently Mr. G. C. Shortridge obtained a specimen at Banlaw, north of Mergui (Wroughton, Journ. Bombay N. H. Soc., xxiii, p. 708; 1915): the present example therefore extends the range some 500 miles down the Peninsula.

I have seen no topotypes of *P. nudipes* and the only obvious justification for separating the Patani specimen rests on the smaller feet of the latter (7.1 against 8.6 mm.): but it is improbable that *nudipes*



and animals occurring 700 miles away from the typical locality are of the same race.

## 2. *Crocidura aagaardi*, sp. nov.

*Type* (and only specimen examined). Adult female, skin and skull. Collected at Bang Nara, Patani, Peninsular Siam, by Mr. C. J. Aagaard. Author's number 2604/C.B.K.

*Characters.* Darker than any of the shrews known from the Malay Peninsula and any of the small islands immediately adjacent and with much less of the brown tinge which characterises all these except *C. gravida* of Langkawi.\* Skull relatively broader.

Larger and darker than the mainland form previously described from Perak, *C. malayana* Robinson and Kloss, which is markedly brown in colour. The skull, though smaller, most nearly resembles that of *C. aoris* Robinson, in robustness but is relatively broader, actually so as regards the anterior part of the rostrum.

*Colour.* As viewed with the head of the specimen pointing to the left and the light falling from in front, above fuscous dusky-drab (Ridgway) apparently very finely frosted in parts, the base of the hair dark neutral grey; below dark hair-brown. (When placed with the head pointing away from the observer and towards the light the colour appears darker and less brown).

*Skull.* The skull is relatively more robust than *C. aoris* and is actually so as regards the rostrum, though the greater breadth is not so noticeable at the palate expansion as in the upper part of the muzzle anterior to it. (Unfortunately it seems impossible to give a measurement in the region where the difference is greatest which can be referred to a definite point).

*Measurements.* Head and body, 77; tail, 56; hind-foot, s. u. 14.5; ear, 9. Skull: greatest length, 22.2; front of incisors to posterior extremity, 23.2; basal length, 19.9; palatal length, 9.8; maxillary tooth-row including incisor, 10.5; breadth of rostrum between lachrymal foramina, 5; greatest breadth of palate expansion outside molars, 7.6; mastoid breadth, 10.4; length of mandible including incisors, 15.1.

*Remarks.* With this specimen I have compared that from Patani

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\* Kloss, Journ. Fed. Malay States Museums, vii, p. 127 (1917).



recorded as *Soriculus nigrescens* by Bonhote in P. Z. S., 1900, p. 874. Though the latter is not so brown as *malayana* it is browner than the present animal. It is perhaps a little faded, but as it is accompanied by neither skull nor measurements it is difficult to say exactly what it is.

### 3. *Scotophilus gairdneri* sp. nov.

*Type* (and only specimen examined). Adult male, skin and skull. Collected at Paknampo, Central Siam, on 6th August 1917, by, Mr. K. G. Gairdner. Author's number 2612/C.B.K.

*Characters.* About the same size as *S. castaneus* Horsf., of the Malay Peninsula, and *S. wroughtoni* Thomas, of Bombay,\* but darker above than either. Rostrum of skull narrower than in *S. castaneus*.

*Colour.* Above bistre, the head darker; the base of the fur, especially anteriorly, brownish white. Below pale drab, the base of the fur whitish, the latter colour showing most on the neck, anal region and thighs: sides of head and neck like the crown, the drab of the fore-neck extending slightly forward in the median line. The membranes bordering the forearms with white hairs, those bordering the sides with pale drab hairs and the interfemoral membrane with yellowish-drab hairs near the body.

*Skull and teeth.* Skull like that of *S. castaneus* but with rostrum and palate narrower. Teeth apparently similar.

*Measurements*:—Head and body, 80; tail, 44; hindfoot, s. u. 9; ear, 15; forearm, 48; tibia, 19.

*Skull*:—greatest upper median length, 16.6; basi-sinual length, 13.4; palatal length, 6.5; palatal breadth between *ms* (alveoli) 4.9; breadth between tips of upper canines, 4.9; breadth of rostrum between anteorbital foramina, 6.2; upper breadth of rostrum between angular points of ridges, 6.9; front of canine to back of last molar, 6.6; greatest length of mandible, 14.0; front of canine to back of last molar, 7.4.

*Remarks.* In its pale underparts this bat bears some resemblance to *S. wroughtoni* which has recently been recorded from Central Burma† and which has the undersurface “very pale fawn, almost

\*Journ. Bombay Nat. Hist Soc., XI, p. 275 (1897). Also Wroughton, op. cit., XII, p. 724, pl. unnumbered, fig. 1 (1899)

† Wroughton, op. cit. XXIII, p. 467 (1915).



white"; but it has the upper pelage much darker. *S. castaneus* is of a brighter brown above and has the undersurface more or less of the same colour as the back though of a paler tint, very different from the whitish-drab of *S. gairdneri*.

#### 4. *Sciurus atrodorsalis thai*, subsp. nov.

*Type.* Adult female (skin and skull). Collected at Raheng, Central Siam, on 23rd July 1916 by Mr. Mr. K. G. Gairdner. Author's number 2474/C. B. K.

*Characters.* Differs from typical *atrodorsalis* Gray, from Moulemein, Tenasserim, in having black vibrissae; head like the body, not reddish-yellow: muzzle alone ochraceous and only a ring round the eye and the ears ferruginous.

Differs from *S. a. shanicus* Ryley, from Goteik, North Shan States,\* in developing a large black patch on the back with the hairs black throughout in adults (in a subadult specimen annulated); muzzle and eye-ring brighter; underparts very different from the back, feet blackish, grizzled, darker than the body.

Differs from *S. a. zimmeensis* (Robinson and Wroughton) from Chiengmai, North Siam,† in the presence of a large black dorsal patch and the absence of any grizzled median line on the chest and abdomen: also smaller.

*Colour.* Above a grizzle of black and warm buff, the latter becoming whitish on the limbs which are thus duller; median area of back from behind the shoulders to above the base of the tail black; muzzle pale ochraceous; a ring round the eye and the ears bright tawny, base of ears at back greyish buffy; fore and hind-feet blackish, slightly grizzled with buffy-white. Tail annulated buff and black, the annulations forming distinct broad bands on the distal half except at the tip where the two colours are mingled. Underparts, except the chin and throat which are buffy-grey, burnt sienna to chestnut.

*Specimens examined.* Three from the type locality.

*Measurements.* Skull: greatest length, 50.0; condylo-basilar length, 42.2; palatilar length, 20.0; diastema, 11.2; upper molar row

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\* Journ. Bombay Nat. Hist. Soc. XXII, p. 663.

† Journ. Federated Malay States Mus., VII, p. 91.



(alveoli), 9.6; median nasal length, 15.0; interorbital breadth, 18.2; zygomatic breadth, 29.8.

*Remarks.* Attention has several times been drawn to the difference between typical *atrolorsalis* with white vibrissae, which seems to be confined to the neighbourhood of Moulmein, and animals from surrounding districts but no distinction has hitherto been made.

### 5. *Rattus rattus thai*, subsp. nov.

*Type*:—Adult female (skin and skull) collected at Raheng, Central Siam, on 23rd January 1917 by Mr. K. G. Gairdner. Author's number 2615/C.B.K.

*Characters*:—Mammæ 3-3=12 as in *Rattus rattus sladeni* (Anderson) from the Kakhien Hills, near Bhamo, and colour apparently similar but skull with larger bullae. Skull as in *R. r. neglectus* of the more southern parts of Siam but colouring rather more ochraceous and with an extra pair of pectoral mammae.

*Colour*:—Above cinnamon to ochraceous-tawny, streaked by numerous blackish hair-tips; base of fur neutral grey. Below white tinged with yellowish. Hands and feet buffy white, the metapodials slightly dusky mesially. Ears dark. Vibrissae black and white. Tail blackish throughout, conspicuously clad with short hairs; twelve rings to the centimetre at mid-length.

*Skull and teeth*:—As in *R. r. neglectus* of more southern parts of Siam with bullae of the same size or hardly appreciably smaller.

*Specimens examined*:—The type and an adult male (No. 2505) from Me Yen, Lakon, North Siam, 1500 ft. collected by Mr Gairdner on 20th November 1915.

*Measurements*:—Head and body, 167; tail, 170; hindfoot, s. u., 31; ear, 22.

*Skull*:—greatest length, 40.2 (41.8)\*; condylo-basilar length, 35.3 (—); diastema, 11.1 (11.0); upper molar-row (alveoli), 7.0 (7.0); length of palatal foramina, 8.0 (8.0); median nasal length, 14.8 (15.2); breadth of combined nasals, 4.0 (4.2); zygomatic breadth, 19.5 (19.8).

*Remarks*: This form seems to link up *sladeni* with the rats of

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\* Measurements in parentheses those of No 2505



Southern Siam, having the mammary formula of the former with the skull of the latter.

I have seen four of the type series of *sladeni* belonging to the Indian Museum: they are preserved in alcohol and now useless as regards colour which, however, was said to have been reddish-brown above and yellowish-white below (Zool. Res. in Yunnan, 1878, p. 305). The skulls are very like the present animal's but the bullae are smaller: three of the specimens are females and the mammae in two are 3-3=12; but in the third, one of the pectoral pairs is absent.

I have also seen three of the type series of *Rattus yunnanensis* (Anderson) from the same district: the mammae of the only female are also 3-3=12 and the skulls so closely agree with those of *sladeni* that they are probably of the same race though they certainly appear to have the smaller external dimensions shown by Anderson.



## ON A THIRD COLLECTION OF SIAMESE MAMMALS.

By C. BODEN KLOSS, F. Z. S.

The specimens on which the present paper is based were sent me by H. R. H. Prince Abhakara of Chumporn and Messrs Aagaard, Eisenhofer, Elves, Gairdner, Irwin, Wedderburn and Yates; also by Messrs Williamson and Smith who as usual are responsible, through their collectors, for the largest number.

Patani, from which some of the material comes, though politically part of Siam, both geographically and zoologically belongs to the Malayan sub-region and is lacking in true Indo-Chinese species, while many species occur in it which have not been found north of the Isthmus of Kra; these, which are purely Malayan, I have marked with an asterisk.

I am much indebted to the above members of the Society for the opportunity of examining their specimens.

1. *Presbytis obscura flavicauda*.

*Pygathrix flavicauda* Elliot, Proc. U. S. Nat. Mus., 38, p. 352 (1910)

*Presbytis obscura flavicauda* Kloss, antea, p. 5.

1 ♂ ad. Bang Nara, Patani, Peninsular Siam. 9 July 1916 [No. 2476].

1 ♂ imm., 1 ♀ ad. Pak Nam Chumporn, S. W. Siam.<sup>1</sup> 11 July 1917 [Nos. 2565-6].

All obtained by Messrs Williamson and Smith's collectors.

The Patani specimen lacks the buffy tinge on the cap of the Leaf-Monkeys from Tung Sawng, Nakon Sri Tamarat, previously described, and its hind limbs and tail are a trifle paler.

One of the Chumporn animals agrees with it but the other has the hinderparts a trifle paler still: it is however unquestionably referable to the Trang race and not to *P. o. smithi* of Pati-yu (antea p. 5).

For measurements see p. 289.

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<sup>1</sup> I have followed Dr. Malcolm Smith (antea, p. 49) in using the term S. W. Siam for the country between the Petchaburi River and the Isthmus of Kra: this area formed the southern and northern extremes respectively of Western and Peninsular Siam as defined in my note on zoogeographical divisions (vol. I, p. 250 and Map) where they were given too great a range of latitude.



2. *Macaca irus*.*Macacus irus* F. Cuv., Mem. Mus. Hist. Nat. Paris, iv., p. 120 (1818).*Macaca irus* Kloss, P. Z. S. 1916, p. 31.2 ♀ ad. Pak Klong<sup>1</sup> Pran, S. W. Siam. 28 June 1917 [Nos. 2545-6].1 ♂ subad., 1 ♀ ad. Pak Nam<sup>1</sup> Chumporn, S. W. Siam. 7 July 1917 [Nos. 2563-4].

All obtained by Messrs Williamson and Smith's collectors.

These Macaques are all dull-coloured animals lacking any bright ochraceous tone in the upper parts, where the yellow element is buff. The Pran animals are rather greyish, the others rather brownish; and the latter have a blackish area extending from the forehead to crown: the top of the head in the Pran specimens is like the back, and as both phases of colour occur with intermediates in animals taken by Mr. Shortridge near Tenasserim Town the differences are evidently only due to individual variation.

## Measurements of Siamese Monkeys in Millimetres.

Collector's external measurements:—				<i>Presbytis</i>		<i>Macaca</i>		
				♂	♀	♀	♀	♀
No.	...	...	...	2476	2566	2545	2546	2563
Head and body	...	...	...	572	534	458	435	430
Tail	...	...	...	770	660	495	425	490
Hind-foot s.u.	...	...	...	172	155	133	114	125
Skull:—								
Greatest length	...	...	...	106	100	109	106	113
Basal length	...	...	...	76	71	78	74	77
Zygomatic breadth	...	...	...	80	73.5	73.5	73	45
Maxillary tooth-row exclusive of incisors (alveoli)...				34	33	38	35.5	36.5

3. *Nycticebus cinereus* M-Edw.

Kloss, antea, p. 76.

1 ♂ ad. Koh Lak, S. W. Siam. Oct 1916. [No. 2464].

This Slow Lemur differs from the very pale example from Koh Lak which I previously described in being generally ochraceous-tawny above, rather deeper on the shoulders and paler on the hind-limbs;

<sup>1</sup> Pak Klong, Pak Nam= Mouth of River.



with the head, nape, fore-limbs to elbow, and hind-feet whitish. The eyes are surrounded by large, dark brown patches and the nape-stripe, which is amber brown, divides on the crown into four branches which run to the eye-patches and the ears. Behind the shoulders the stripe is brownish-black but ceases at the middle of the rump. The lower parts are greyish-white, slightly tinged with ochraceous.

The former specimen is older and this may account for the predominance of whitish-grey in its colour.

Measurements:—head and body, 277; tail, 20; hindfoot, 69; ear, 26.

Skull:—greatest length, 62; basal length, 50; zygomatic breadth, 40; width of braincase above roots of zygomata, 32; maxillary tooth-row exclusive of incisors (alveoli), 21.2; mandibular length, 39.2; distance between ridges on cranium, 4 mm.

#### 4. *Felis rebulosa* Griffith.

Flower, P. Z. S., 1900, p. 324.

Flat skin with skull of a Clouded Leopard obtained near Chiengmai by Mr. H. C. St. J. Yates [No. 2576].

This is a fine adult example with pronounced sagittal and occipital ridges; though the teeth are scarcely worn both a canine and a posterior molar are considerably chipped, showing that it must have fed on large-boned animals:  $pm^1$  is present. The species has a large range, occurring from Sikkim and Formosa southward to Java.

The general colour is a deep buff with the lower parts and inner sides of the limbs white: the areas on the upper parts which are more or less surrounded by black borders, broadest posteriorly, frequently contain dusky spots and are darker than the reticulations as the hairs have dusky bases. Interrupted black lines run from crown to tail and the limbs and underparts exhibit large black spots.

Skull: greatest length, 191; condylo-basilar length, 172; tip of premaxillaries to back of palate, 78; upper tooth row excluding incisors (alveoli), 63.5; length of canine in front from alveolus, 42; greatest length of upper sectorial (and also transverse length), 21.3;  $pm^3$ – $pm^3$  (alveoli), 38; breadth of muzzle above canines, 49; interorbital breadth, 33; zygomatic breadth, 122; mastoid breadth, 73; front of foramen



magnum to extremity of occipital crest, 51 : greatest length of mandible, 132 ; lower cheek-teeth (alveoli) 41 mm.

These dimensions slightly exceed those given by Blanford of a skull from Assam "larger than usual" (Fauna Brit. Ind. Mamm., p. 73).

### 5. *Felis temmincki* Vig. & Horsf.

Kloss, *antea*, p. 79.

1 ♂ ad., Chiengmai, North Siam, 800 ft. 14 March 1916. Collected by Mr. K. G. Gairdner [No. 2605].

This is the specimen of which Mr Gairdner has already given some account on p. 251 : though adult it is not aged and would probably have grown larger if it had lived longer. The species was described from Sumatran material and Hodgson independently described a Nepal specimen and named it *F. moormensis*. Northern animals are not infrequently larger than their equatorial representatives and if the Himalayan animal is different it will be known as *F. t. moormensis* but a distinction on size should not be made until good series from various districts have been compared, and unfortunately topotypes are very rare.

I have received some interesting notes from Mr. H. C. St. J. Yates who obtained the skin recorded on p. 79. Mr. Gairdner says that this animal is alleged to be very fierce and a match for the tiger but Mr. Yates notes that one was shot after being treed by a pariah dog : reputation and behaviour are not reconcilable and the latter is more worthy of credence as the animal is not even a leopard but only a large cat. Mr. Yates writes, "Local properties assigned are :—

It is the master of all other tiger-cats and leopards.

If its fur is burnt by a bullock caravan when a tiger is near the tiger is scared away.

If it is cooked, skin, fur and all (and eaten), it acts as a protection to a man against attack of any beast.

It is said that the strength of the animal lies in its jaw which is out of all proportion to the body (the jaw is really of normal size). Once it has hold it never looses its grip and always fastens on to the throat. The following instance was given : a villager and his dog met a "siah fai" and the dog went for the cat which fixed on the other's throat and was only taken off after it had been shot."



### 6. *Viverra zibetha pruinosa* Wroughton.

Journ. Bombay N. H. Soc., XXIV, p. 164 (1915).

*Viverra zibetha* Kloss, Journ. Straits Branch R. A. Soc., No. 53, p. 18 (1909).

1 ♀ ad. Bang Nara, Patani, Peninsular Siam. 16 July 1916.  
Messrs. Williamson and Smith's collectors. [No. 2477].

Wroughton has separated the Marbled Civet of the Shan States, Tenasserim and the Malay Peninsula from the Indian animal on account of total absence of any yellow tinge in the ground colour of the fur, the tips of the hairs being white, not buffy, so that the general colour is pale grey with black markings.

Mr. C. J. Aagaard has sent me, also from Bang Nara, a skull said to be that of *V. z. pruinosa*; it is much larger than the other and is probably that of a male (measurements in parentheses).

Head and body, 818; tail, 435; hind-foot, s.u., 121; ear, 51.

Skull: greatest length, 142 (155); basal length, 130 (142); zygomatic breadth, 67.5 (73); breadth of braincase, 39 (43.5); maxillary tooth-row exclusive of incisors (alveoli), 53 (63); greatest length of upper sectorial, 14.7 (15.5).

### 7. *Paradoxurus hermaphroditus rarus*.

*Paradoxurus rarus*, Miller, Smithsonian Miscellaneous Collections, Vol. 61, No. 21, p. 2 (1913).

*Paradoxurus hermaphroditus*, Gyldenstolpe, Kungl. Sv. Vet. Akad. Handl., 57, No. 2, p. 25, plate iv, figs. 1 & 3, (1917).

*Paradoxurus hermaphroditus rarus*, Gyldenstolpe, op. cit., p. 25.

1 ♀ juv. Central Siam. 1916 [No. 2560].

1 ♀ imm. Pak Nam Chumporn, S. W. Siam. 11 July 1917  
[No. 2652].

1 ♀ young ad. Bang Nara, Patani, Peninsular Siam. 12 July 1916 [No. 2478].

The first of these Palm-Civets was sent me by H. R. H. the Prince of Chumporn and the others by Messrs. Williamson and Smith.

I have recorded them under Miller's name because on the whole they are greyer, with less of a yellowish-brown tinge in the ground colour, than animals of the Malay States which are typical *hermaphroditus*.

At the same time it may be noted that the race is not a very distinct one and (after examination of a series of palm-civets ranging



from Siam to Selangor) the best to be said of it is that the dark markings are blacker while the grey animals are greyer and the buffy examples much less buffy or brownish than any of the Southern animals. Of *P. h. hermaphroditus* immature examples are the most richly coloured, some being suffused with ochraceous; but I have taken no account of them in my comparison.

The form *ravus* extends northwards from Perlis and Patani but North Siam animals have been named *P. h. laotum* by Gyldenstolpe (op. cit. p. 26, p. iv, figs. 2 and 4) on account of supposed greater size.

Measurements of No. 2478. Head and body, 527; tail, 529; hind-foot, s. u., 81. Skull: greatest length, 102; basal length, 97.5; zygomatic breadth, 54; maxillary tooth-row exclusive of incisors (alveoli), 38 mm.

### 8. *Arctictis binturong binturong*.

*Viverra? binturong* Raffles. Trans. Linn. Soc., xiii, p. 253 (1821).

1 ♂ ad. Bang Nara, Patani, Peninsular Siam. Mr. C. J. Aagaard. [No 2574].

Colour black; head grizzled with white; limbs and, to a less degree, the upper parts of the body grizzled with buffy; median line of the undersurface grizzled with ochraceous; anal region and base of tail buffy, rest of tail black. Ears fringed with buffy and with long black tips. Vibrissae black and white.

Total length (nose to tail tip) 1677 mm. (5ft. 6in).

Skull: greatest length, 146; condylo-basal length, 144; zygomatic breadth, 86; nasals, mesial length, 26, breadth at middle, 12.5; interorbital breadth, 37; tip to tip of postorbital processes, 54; breadth immediately behind the latter, 46; breadth at fronto-parietal suture, 41; greatest posterior breadth on ridges, 60; height of crown from posterior palate, 47.5; palatal length, 77; breadth of posterior palate, 20.5; maxillary tooth-row exclusive of incisors (alveoli), 46; mandibular tooth-row, 57.

Having compared a skull (presumably male) of a Bear-Cat from Sai Yoke, W. Siam, with a male skull from Perak, Malay States, Thomas decided that the former represented a distinct form which he named *Arctictis gairdneri* (Ann. and Mag. (S), xvii, p. 279) on account of larger size (greatest length of skull 153 mm) and differences in the



characters. The skull was that of an aged individual ("crests greatly developed, teeth much worn down") which might account for the dimensions.

The type of *A. binturong* came from Malacca and females from the neighbourhood have skull lengths of 145 and 146 mm, while Lyon records a male from East Sumatra with a skull length of 145 mm. (Proc. U. S. Nat Mus., xxxiv, p. 651, 1908) and none of these appear to be as old as the Sai Yoke specimen.

Lyon has also drawn attention to the variation in characters and size which are shown by skulls from one district, features which are confirmed by Malayan animals. The difference in length between the skulls of *A. gairdneri* and the specimens mentioned above (less than one-third of an inch) cannot be considered of much importance in such an animal and, while none of the southern examples are old, Mr. Gairdner seems to have been fortunate in securing an aged individual.

The principal difference between the Sai Yoke and Malayan animals appears to be in breadth of skull and the latter may develop this character in old age; in *Paradoxurus* the skulls of aged animals are much broader than those which are merely fully adult and it may be that the case is the same with *Arctictis*: other features, such as parallel-sided nasals and vaulted skull occur in topotypes and the bullae are also very variable.

I agree with Lyon that the grizzled and grey phase is not entirely characteristic of the young; at the same time it is much more frequent and profuse in them than in adults. Among a series of Malayan specimens there are two from Selangor of exactly the same age; one of them is the most completely black of all and the other is as grizzled as any of the juveniles, which are much more grizzled than the oldest animals: the hair-tips of the former are markedly ochraceous and it seems doubtful whether Lyon was justified in describing *A. niasense* (op. cit., Vol. 52, p. 443; 1916) from a flat skin of which the age is unknown: the measurements given indicate a small, and probably young, animal.

Owing to their habits, largely nocturnal and arboreal, the Bearcat is not easily obtained and at present is represented in collections by inadequate series.



9. *Cyon javanicus*.

*Canis javanicus*, Desm. Mamm., p. 193 ; 1820 (Java).

*Canis familiaris* var. *sumatrensis*, Hardwicke, Trans. Linn. Soc., xiii, p. 235, pl. 23 ; May 1821 (Sumatra).

*Canis rutilans*, S. Müll. in Temminck's Verhandelingen, Zoologie, Inleiding, pp. 27, 51 ; 1839-44 (Java).

1 ♀ ad. Bang Nara, Patani, Peninsular Siam, 28 July 1916. Messrs. Williamson and Smith's collectors [No. 2479].

General colour rufous (Sanford's brown), many of the hairs on head, neck and back black-tipped. Innerside of ears, upper lip, chin and throat, chest and abdomen and inner side of thighs whitish : a rufous collar between throat and chest, the middle part of the underbody tinged with rufous. Inner sides of fore-limbs whitish, this colour extending somewhat over the upper sides of the feet ; inner side of hind-limbs speckled with whitish which extends over the inner upper surface of the feet. Tail rufous proximally but blackened above and white at the base ; terminal half black, the hairs dull rufous at their bases. Feet with long hair between the paws.

Head and body 896 ; tail 332.

Skull : greatest length, 180 ; basal length, 158 ; zygomatic breadth, 100.5 ; maxillary tooth-row exclusive of incisors (alveoli), 73 ; greatest length of upper sectorial, 19.8.

Near Korat last year I nearly trod on a solitary Wild Dog that was lying in a patch of long grass.

10. *Martes flavigula indochinensis*.

Kloss, P. Z. S., 1916, p. 35.

1 ♀ ad. (teeth unworn), Lat Bua Kao, E. Siam. 15 Sept. 1916. Mr. W. J. F. Williamson's collector [No. 2470].

This example of the Siamese Marten is rather younger and smaller than the type, also a female, which came from Klong Menao, S. E. Siam, and its colours are rather more intense throughout. The differences are such as might be due to age or individual variation.

Entire upper surface of head and anterior part of nape, back of ears, hind-feet and base of tail blackish-brown ; tail black, the hairs with brown bases ; distal half of fore-limbs, thighs and rump bistre, these colours gradually changing into bright buff-yellow on the shoul-



ders and warm buff on the lower back and flanks; median dorsal line from mid-back to tail a variable bistre; sides of neck between ears to shoulders apricot yellow; sides of upper lip, chin and throat white blending with the yellow of the neck; rest of the under-surface chamois. Areas below eyes and upper-side of forelimbs proximally grizzled white and bistre; ears bistre, their edges and centre whitish.

External measurements:—head and body, 472; tail, 357; hind-feet, s. u., 88; ear 35.

Skull:—greatest length, 86; basal length, 79; upper tooth-row excluding incisors (alveoli), 26.5; greatest diameter of  $m^1$ , 8.0; least palatal breadth between carnassials, 14.6; least interorbital breadth, 19; breadth at postorbital constriction, 22; zygomatic breadth 50.5.

### 11. *Arctonyx collaris* dictator.

*Arctonyx collaris*, Kloss, Journ. Straits. Branch R. A. Soc., No. 53 p. 32 (1909); Gairdner, Journ. N. H. Soc. Siam, 1, p. 253 (1915).

*Arctonyx dictator*, Thomas, Ann & Mag. Nat. Hist. (8), V, p. 424 (1910); Kloss, *antea* p. 8.

1 juv. near Sisophon, S. E. Siam. H. R. H. the Prince of Chumphorn. [No. 2465].

This Hog-badger, which seems to be the first specimen of an *Arctonyx* taken east of the Menam, died in captivity and is unfortunately very cage-worn and young.

It is a little larger and older than a young animal from Nakon Sritamarat (*antea* p. 8) having just got rid of all its milk teeth. Greatest upper length of skull, 129; zygomatic breadth, 60.8; greatest diameter of  $m^1$ , 16.6, of  $pm_4$ , 19 mm.

*Arctonyx dictator* still really rests on the type, an old female from Trang, Peninsular Siam, much larger than any known examples of *collaris* of Assam and Burma or *hoeveni* of Sumatra: it does not seem to be more than a large race of the former and that such should occur between two smaller forms is rather unusual. Badgers are reported in the Malay Peninsula as far south as Upper Perak where they are known as "Sabima".

### 12. *Ursus tibetanus* subsp.

*Ursus tibetanus*, F. Cuv., Hist. Nat. Mamm., pl. 213 (1824).

*Ursus torquatus*, Blanford, Lydekker, Wroughton et auct.



Flat skin with skull (immature) from near Sisophon, S. E. Siam H. R. II. the Prince of Chumphon [No. 2501].

Gyldenstolpe has recorded this species of Bear from North Siam but, I believe, erroneously. The evidence advanced is the photograph of a young animal which appears to be unquestionably only an example of the common short-haired bear *Ursus malayanus* (Kungl. Sv. Akad. Handl., 57, No. 2, p. 21, pl. 2, figs 1, 2; 1917).

The present specimen is thus apparently the first of its kind met with south of China and east of Tenasserim. It appears to be very typical as far as the pelage is concerned with long wavy hair, fringed ears, whitish muzzle and small gorget. The permanent teeth are all in place but the animal is quite young with faintly marked ridges on the cranium about 55 mm. apart at the fronto-parietal sutures.

The skull is imperfect but the greatest upper length on the median line is 202 mm., zygomatic breadth 115 mm.; and breadth of palate between the last molars 30 mm.; though it has the elongate shape of *U. tibetanus* (as figured by Lydekker under the name of *U. torquatus* in P. Z. S. 1909, pp. 607-10, text figure 186-7\*) it would certainly have broadened relatively with age. The teeth most nearly resemble those of *U. t. macneilli* Lydekker (loc. cit †), but the three upper anterior premolars are rather crowded (more than in Lydekker's figure of "*torquatus*") the 2nd and 3rd being outside the median line of the tooth-row; and the length of the six upper cheek-teeth together is only 68 mm. against 99 mm.

The measurements of the posterior teeth (and those of the type of *macneilli*) are:—

	Type of <i>macneilli</i> .	Cambodian specimen.
Length of last 3 upper cheek-teeth	53.8	57.3
"    "    "    upper molar	25.0	27.0
Width "    "    "    "	15.1	15.5

\* Note the following error regarding both figures: though the skulls are indicated by letters which agree with the text, in the legends attached for A read B and for B read A.

† Typical locality "some distance to the westward of Tachien" which is in Szechuan, long 102°20', lat. 30°5'; not "Assam" as stated by Wroughton in Journ. Bombay N. H. Soc., xxiv, p. 769 (1916).



Length of last 3 lower cheek-teeth	55.2	55.5
" " " lower molar	15.2	15.0
Width " " " "	10.6	11.3
Length of penultimate lower molar	20.1	20.0

Though the length of the last three upper molars is as in the type of *U. t. formosus* Swinh. the teeth are quite different in shape from those of that animal and the skull is very much narrower.

In the same article Lydekker gave some account of a female skull from Assam with teeth smaller than the type of *macneilli* (last 3 upper cheek-teeth 50.7 mm.) but because of the much wider palate in the former did not associate it with the new race; for he considered that in *macneilli* the palate of the female (as represented by a Szechuan skull) is relatively narrower than in the male (31.8 against 39.4 mm.), whereas the palate of the Assam female is considerably broader (45.7 mm.). The status of the latter form is left in doubt and that of the present animal must remain undecided until adult examples have been procured.

### 13. *Gymnura gymnura minor*.

Lyon, Proc. U. S. Nat. Mus., xxxvi, pls 34, fig. 1, and 35, fig. 1 (1909).

1 ♂ ad. Bang Nara, Patani, Peninsular Siam. 19 December 1916. Mr. C. J. Aagaard [No. 2573].

The race was defined differing from the typical animal of Sumatra in rather smaller size, but it is more markedly distinguished in the reduction of the whitish area of the back. The Southern form has the white-tipped hairs extending over more than three-fourths of the length of head and body with the whitened area ending broadly across the rump so that viewed from below numerous white tips are visible: the Northern race has the white-tipped hairs extending over less than two-thirds of the length of head and body with the whitened area ending in a point and not spreading over the sides, so that from below no white hairs can be seen: in the latter form also the pale terminal portion of the tail is generally shorter.

The animal is remarkable for the strong offensive odour which clings to the skin for years.



Hindfoot s. u., in dried skin, 57 mm.

Skull:—condylo-basal length, 80; basal length, 75; palatal length, 46.2; least breadth between penultimate molars, 13; zygomatic breadth, 38; upper tooth-row (alveoli), 41;  $p^3-m^3$  (alveoli), 25; lower tooth-row (alveoli), 38;  $p_3-m_3$  (alveoli), 21.5; mandible (to back of condyle), 60.4.

#### 14. *Parascaptor leucera*.

*Talpa leucera*, Blyth, Journ. Asiat. Soc. Bengal, xix, p. 215, pl. iv, figs 1, 1 a (1850).

*Parascaptor leucera*, Dobson, Mon. Insectivora, pt. ii, p. 140, pl. xx, figs 9 and 9b (1883).

Skin from Doi Nga Chang, S. E. of Chiangmai, N. Siam, 4000 ft. Collected by Mr. Emil Eisenhofer.

Held crossways with the light falling from the front the colour appears as mouse grey strongly suffused with drab, the result being almost hair-brown; chin and throat tinged with light brown, chest less so: hands thinly clad with buffy, feet with greyish hairs.

End of snout and top of muzzle naked for about 8 mm., with a median depression: tail thicker at end than at base and bearing a number of pale greyish hairs, 17-18 mm. long.

Head and body, 125; tail, 8; hind-foot, 14.5; breadth of hands 13, length, including nails, 17 mm.

This Mole has not been met with hitherto Eastwards of the Sit-tang River, Burma, so the present specimen extends the range in that direction by a hundred and fifty miles.

Blanford\* states "colour uniform brown in all the skins I have examined but described as black by Anderson †, perhaps variable." Of *Talpa micrura* he says ‡ "Uniform velvety black when fresh . . . dried skins often brown," so it may be that instead of being variable *P. leucera* also undergoes a change of colour after death.

#### 15. *Galeopterus temmincki peninsulæ*.

*Galeopterus peninsulæ*, Thomas, Ann. & Mag. Nat. Hist. (8), ii, p. 303 (1908).

*Galeopithecus volans*, Auct.

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\* Fauna. Brit. Ind, Mamm. p. 227 (1888).

† Cat. Mamm. Ind. Mus, pt. 1, p. 170 (1881).

‡ op. cit., p. 225.



1 ♂ ad. Bang Nara, Peninsular Siam. 10 July 1916. Messrs. Williamson and Smith's collectors. [No. 2484].

Head and upper parts of various colour blending together—dull tawny, greyish buff, grey—vermiculated throughout with black; edge of the membrane Mars brown; face dull and dark; small white patches on the rump and a number of white spots on the hand, forelimbs and feet.

All males of the local Flying-lemur are more or less rufous above while the females are greyish; males are also smaller; female skull attaining a condyle-basilar length of 76, though the more usual size is 72 mm.

Native collector's external measurements: head and body, 370; tail, 259; hind-foot s. u., 69; ear, 24. Skull: greatest length, 71; condylo-basal length, 67.2; palatal length, 34.5; palatal breadth behind canine (alveoli), 21; least interorbital breadth, 17; external biorbital breadth, 45.2; zygomatic breadth, 43.1; maxillary tooth-row (alveoli), 33.9; maxillary molar series (alveoli), 18; greatest length of  $pm^2$  or canine, 6.9.

#### 16. *Cynopterus angulatus*.

Miller, Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 316.

*Cynopterus sphinc*, Bonhote (partim), P. Z. S., 1900, p. 191; id., op. cit., 1902, ii, p. 38.

*Cynopterus marginatus*, Flower, P. Z. S. 1900, p. 340.

*Cynopterus brachyotis angulatus*. Anderson, Cat. Chir. B. M., 1, p. 611 (1912).

1 ♂ young adult. Pa Kok, Me Wang, North Siam, 1000 ft. 12 November 1915. Collected by Mr. K. G. Gairdner [No. 2504].

A rather dull-coloured example of Lesser Fruit-bat with the cranial ridge between three and four millimetres broad. It is as large as many specimens of *C. sphinc sphinc* but the distance from orbit to nares is less than a quarter of the length of the skull.

Measurements. Skull:—lambda to gnathion, 33.5; rostrum (orbit to nares), 7.5; mandible, 26.0; maxillary teeth, crowns, 11.4. Forearm, 69; 3rd digit, metacarpal, 45.4; 3rd digit. 1st phalanx, 30; tibia 25 mm.

#### 17. *Emballonura monticola* Temminck.

*Emballonura monticola*, Thomas in Wroughton, Journ. Bombay N.H.



Soc., xxiii, p. 706, (1915); id., Journ. F. M. S. Mus., vi, p. 4 (1916).

*Emballonura peninsulae*, Miller, Proc. Acad. Nat. Sci. Philadelphia, (1898), p. 323.

2 ♂. Bang Nara, Patani, Peninsular Siam, July 1916. Messrs. Williamson and Smith's collectors [Nos. 2590-1].

These specimen are badly smashed but the forearms have lengths of 40 and 44.8 mm.

### 18 *Scotophilus belangeri*.

Is. Geoffr., Belang. Voy. aux Indes. orient., 1834, p. 87, 92, pl. 3.

1 ♂ in spirit, Bangkok, Siam, June 1917. Collected by Dr. Malcolm Smith [No. 2611].

Colour (dried from spirit) above fuscous, below olive buff (Ridgway).

Head and body 76; tail, 56; hind-foot s. u., 12; ear, 17; forearm, 53, tibia, 22.

*S. belangeri* has a forearm of 58 mm. and though I have no other information about it I believe it came from Burma so place this specimen under the name.

### 19. *Hipposideros diadema vicarius*.

Andersen, Ann. and Mag. Nat Hist, (7) xvi, p. 499, 597 (1905).

1 ♂ ad., skin and skull; 1 ♀ ad., spirit specimen. Bang Nara, Patani, Peninsular Siam. 4 July and 10 Aug. 1916. Messrs. Williamson and Smith's collectors. [Nos 2485, 2589].

The description of *H. d. vicarius* seems to fit these specimens and as they come from a region between Borneo and Sumatra, in both of which that race occurs, they may be considered members of it.

The posterior nose-leaf is clearly divided into four cells.

Colour of skin specimen:—head and neck whitish tinged with cinnamon brown; back cinnamon brown with a white spot below the shoulders and an elongate white patch bordering the membrane on each side; forearm thinly clad with ochraceous hairs. Undersurface drab, pale and greyish on the foreneck; upper arms whitish.

Measurements: head and body, 93 (87\*); tail, 48 (51); hind-foot, s. u., 12 (12.7); ear, 30 (29). Forearm 81.2 (84); third

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\* Measurements in parentheses those of the female.



metacarpal, 62, (63.5); tibia (32.5). Skull: greatest length, 31.4; anteorbital breadth, 9.5; upper teeth (front of canine to back of molar), 12.9.

## 20. *Petaurista lylei*.

Boulhote, P. Z. S., 1900, p. 192, pl. xiii; id., op. cit., 1901, p. 53.

Flat skin of a male from 90 miles north of Muang Pre, N. Siam. Collected by Mr. C. C. Wedderburn. May 1917 [No. 2575].

The head and back and much of the upperside of the limbs are covered with hair blackish to greyish at the base, then chestnut or brown succeeded by a white annulation and a black tip—the general colour effect from a distance being grey. The limbs and membranes are covered above with hair blackish at the base, rufous or ferruginous at the tip.

The hands and feet are black and the membranes near the limbs are edged with the same colour, sometimes mixed with brownish; the middle portion of the parachute is bordered with dark brown grizzled with whitish.

The forelimbs are black beneath but the rest of the underparts is of a colour intermediate between tawny and burnt sienna, deepening to rich ferruginous on the hind-limbs and near the edges of the membranes and mixed with white on the median line and the extreme base of the tail.

The distal half of the tail is black but on the basal portion only the tips of the hairs are black, their bases being dark brown and the middle portions greyish to ochraceous.

The eyes are narrowly ringed with black bordered above and below with ferruginous and the muzzle appears to the dark brown.

The outer sides of the ears are black, rather grizzled towards the tips where the edges are ochraceous-orange. The backs are anteriorly (proectote) and at tips covered with short ochraceous-orange hairs: posteriorly and basally (metectote) they are clad with long black hair which is continued along the sides of the neck to form a broad elongate patch.

*P. l. venningi*\* of the South Shan States differs in having no ferruginous colour in the concealed underfur of the back, the proectote

\* Thomas, Journ Bombay N. H. Soc., xxiii, p. 26 (1914).



duller and more of a fawn colour and no rufous spots above the eye; it is more brownish below (fawn coloured) and the parachute is darker throughout.

*P. a. barroni* of Central and S. E. Siam (antea, pp. 33,81) is altogether a paler animal though less markedly grey above; it has membranes brighter and much less black-edged, white patches on the shoulders and the front of the membrane adjacent bright ferruginous, the proectote whitish, and only the last three or four inches of the tail black.

An example of Barron's Flying Squirrel was kept for some time by Dr. Malcolm Smith in his house where it was given complete freedom: it made a charming pet though it slept for the greater part of the day. We noticed with interest that the principal use of the calcaneum, or bony spur, attached to the outer side of the wrist was to fold up and support the parachute when the animal was running and leaping about: without this provision for tucking away the membrane the squirrel would apparently be unable to walk for tripping over itself. Mr. R. W. G. Hingston who has given a long account of "the attitudes and movements of the large red flying squirrel *Petaurista inornatus*" does not seem to have remarked this.†

## 21. *Petaurista petaurista melanotus*

*Pteromys melanotus* Gray, Mag. Nat Hist, New Series, i, p. 584, (1837)

*Petaurista nitida melanotus* Thomas, Ann. and Mag. Nat. Hist., (8) i, p. 250 (1908).

1 ♀ ad., Bang Nara, Patani, Peninsular Siam. 14 Aug. 1916. Messrs. Williamson and Smith's collectors (No. 2497).

This race of the Large Red Flying-squirrel differs principally from *P. p. cicut* (antea, p. 14) in having the black-tipped hairs much reduced in number. The specimen is rufous (burnt sienna) above and the black tips are confined to the middle line of the shoulders and back.

Collectors' external measurements: head and body, 425; tail, 505; hind-foot, s. u., 73; ear, 43.

Skull: greatest length, 72; condylo-basilar length, 62.2; pala-

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† Journ. Bombay N. H. Soc, xxiii, p. 344 (1914).



tilar length, 33; diastema, 14.8; upper tooth-row (alveoli) 18; greatest length of nasals, 21.2; greatest breadth of nasals, 12.3; inter-orbital breadth, 16; width between tips of postorbital processes, 36.3; zygomatic breadth, 47.

## 22. *Petinomys phipsoni*.

*Pteromys* (*Petinomys*) *phipsoni*, Thomas, Journ. Bombay Nat. Hist. Soc., XXIV, p. 432 (1916). (Tenasserim Town.)

*Petinomys rordermanni*, Kloss, Journ. Fed. Malay States Museums, VI, p. 251 (1916).

1 ♂ ad. Bang Nara, Patani, Peninsular Siam. Mr. C. J. Aagaard [No. 2577.].

1 ♀ ad., 1 ♂ juv., 1 ♀ juv. Same locality. 9 July 1916. Dr. Malcolm Smith's collector [No. 2472, 2601-2].

*Colour.* Above blackish (bases of the hairs blackish-slate) washed with fulvous to cinnamon, most strongly on the posterior dorsal line and rump where the tips are cinnamon; sides of neck strongly buffy; limbs and parachute darkest, black only slightly grizzled with fulvous. A ring round the eye and a line running thence to the extremity of the muzzle black. Cheeks and sides of throat capucine orange.

Undersurface of body and limbs and a sharply margined median area on the throat white, the hind-limbs tinged with fulvous: undersurface of parachute brownish black grizzled with pale yellow orange; edges of parachute yellow orange; edges of interfemoral membrane ochraceous-orange.

Bases of the ears with tufts of black hair a little longer than the ears themselves. Hands and feet dark brown above edged with pale ochraceous-buffy; inner sides of forelimbs buffy. Tail above very bushy and scarcely distichous, dark brown, the hairs tipped with fulvous which is in excess at the base: below the distichous portion of similar colour, but the base paler and the median line fulvous.

The above description is taken from the female which was discovered in a hole in a tree with two young animals having the eyes still unopened. They are much brighter in colour than the parent, being cinnamon brown above with little trace of black, and the membranes are largely naked. The most interesting difference is in the tail



where the hair is short and points towards the tip instead of having the distichous arrangement of the adult.

The adult male, which has been in spirit, generally agrees with the adult female but has the head like the rump and lacks the long black hair behind the ears.

Both the small anterior premolars are absent in the female and Mr. Oldfield Thomas, to whom I sent it for inspection, writes me that it is his *P. phipsoni*: I think there is no doubt, however, that when continental specimens have been compared with topotypes of *P. vordermanni* (Jentink) of Billiton Island we shall have to regard this flying-squirrel as merely a local race of that animal.

Measurements of male and female respectively:—Head and body, 111, 120\*; tail, 104, 110\*; hindfoot, s.u. 23, 21\*; ear, 14, 18\* (13?).

Skull:—greatest length, 31.1, 31.0; condylo-basilar length 27.0, 26.5; basilar length, 25.5, 24.2; palatilar length, 13.1, 12.7; diastema, 6.2, 6.3; upper tooth-row (alveoli), 6.0, 5.9; median nasal length, 7.6, 6.7; greatest nasal length, 7.6, 7.2; greatest breadth of nasals, 4.5, 4.4; interorbital breadth, 6.2, 6.7; cranial breadth, 17.5, 17.0; zygomatic breadth 18.3, 18.0.

### 23. *Ratufa melanopepla peninsulæ*.

Miller, Smithsonian Miscellaneous Collections, 61, p. 25 (1913).

1 ♂ ad. Bang Nara, Patani, Peninsular Siam. 5 July 1916.

Messrs. Williamson and Smith's collectors [No. 2486].

Pelage much abraded and "bleached" brownish above.

For measurements see p. 312.

### 24. *Ratufa melanopepla phaeopepla*.

*Ratufa phaeopepla*, Miller, Smithsonian Miscellaneous Collections, 61, p. 25 (1913); Kloss, *antea*, p. 81

Two flat skins from Sai Yoke District above Kanburi, W. Siam. January 1917. Collected by Mr. A. J. Irwin. [Nos. 2569-70].

Colour brownish above.

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\* By native collector.



25. *Ratufa melanopepla leucogenys*.

Kloss, P. Z. S., 1916, 43; id., *antea*, p. 15.

1 ♀ ad. Nong Kha near Sriracha, S. E. Siam. 14 July 1917.  
Mr. W. J. F. Williamson's collector [No. 2499].

This is the only example of a *Ratufa* taken in Siam and Tenasserim during the hot and rainy season that I have seen, for these localities are generally visited by collectors in the winter months when the weather is cool and dry.

It is pure black above except for a slightly indicated brownish patch on the nape, and for the whole of the rump and a great part of the tail which are chestnut brown: the pelage having the latter colour is old and abraded while the rest is quite fresh.

This suggests the question whether the brown colour of *phaeopepla* is constant or is only a dry season phase: *leucogenys*, however, from similar latitudes, is blackish in the dry season.

*Ratufa phaeopepla* is stated to have a skull length of 74-78 mm in full grown animals, whereas typical *leucogenys* is apparently smaller agreeing with *peninsulæ* in a skull of about 73 mm or less: the present specimen is large, but in spite of that, and of its brown rump and tail, I have identified it as *leucogenys* because of the greater extension of buff over the forelimbs and hind-feet which seems to be a character distinguishing that race from *phaeopepla*, and which will serve to separate them where differences in size and colour of back fail to do so; the colour of the yellow parts seems to be the same in both races. Possibly the specimen is intermediate, the typical locality of *phaeopepla* being S. Tenasserim, that of *leucogenys* S. E. Chantabun.

I have received from North Siam what appears to be, by comparison with topotypes, an undoubted example of *phaeopepla* collected at Muang Pre, (*antea*, p. 81) but from Pak Koh and Koon Tan to the eastwards, Gyldenstolpe\* records *R. m. marana*, Thomas and Wroughton, of Popa, Central Burma: the difference between these two, both of which attain a skull length of 74 mm. or more, seems to be that the latter is black instead of brown. Possibly Gyldenstolpe's specimens, again, are intermediate as they are pure blackish brown.

Of the form inhabiting Peninsular Siam and the Malay States

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\* Kungl. Sv. Vet. Akad. Handl., 57, No. 2. p. 31 (1917)



Miller writes "From Trang to the southern limit of the group *R. m. peninsulæ* appears to be very constant in its characters" (*loc. cit.*) but this, judging from a large amount of material examined, is hardly accurate. Excluding the effects of obvious "bleaching" the colour of the upper parts varies from a clear black (not common) to a blackish brown, sometimes indistinguishable from the brown of *phacopepla*: the underparts are also variable—at any rate in Malay States animals—for in a series of them the underparts of one-fourth are as richly coloured as in many of the Siamese and Malayan island forms, including a typical series from Terutau Island, which all (except *R. m. decolorata*† from Koh Samui and Koh Pennan, Coast of Bandon) differ from the mainland animals, with the above exceptions, in being more richly and deeply coloured below (I have not seen *caelanopepla* Miller, from Domel Island, Mergui Archipelago).

Except for size, therefore, *phacopepla* does not seem to be a very clearly marked form; and young adults are no bigger than *peninsulæ*.

For measurements see p. 312.

## 26. *Ratufa aureiventer*

*Ratufa affinis aureiventer*, Bonhote, Ann. and Mag. Nat. Hist., (7), V, p. 495 (1900).

*Ratufa aureiventer* Kloss, antea p. 82.

1 ♂ ad. Bang Nara, Patani, Peninsular Siam. 2 July 1916. Messrs. Williamson and Smith's collectors. [No. 2489].

This example, though in very worn pelage, seems to satisfactorily confirm my determination of a previous specimen from the same locality.

For measurements see p. 123.

## 27. *Ratufa pyrrsonota*.

Miller, Proc. Biol. Soc. Washington, II, p. 75 (1900); Kloss, antea, p. 15.

1 ♀ aged, Bang Nara, Patani, Peninsular Siam. 2 July 1916. Messrs. Williamson and Smith's collectors [No. 2487].

1 ♂ young adult. Same locality. Mr. C. J. Aagaard [No. 2488].

Both examples are in rather worn and faded pelage and so consi-

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† Robinson & Kloss, Ann and Mag. Nat. Hist. (8) xiii, p. 227 (1914).



derably paler than the specimen previously recorded from Nakorn Sritamarat.

For measurements see p. 312.

### 28. *Sciurus prevosti prevosti*.

*Sciurus prevostii*, Desm., Mamm., p. 335 (1822).

*Sciurus prevosti prevosti*, Kloss, antea, p. 82.

1 ♀ ad, 1 ♂ young adult. Bang Nara, Patani, Peninsular Siam. June and July, 1916. Messrs Williamson and Smith's collectors [Nos. 2490-1].

These further examples show that the specimen formerly attributed to Patani was so done correctly. They only differ from it in having less, or no white on the hands and feet and in the greater definition of the black stripes below the white of the sides. All three are very typical in appearance. This form occupies Johore, Malacca and Pahang east of a line joining Malacca and the bend of the Pahang River, and probably all the east coast of the Peninsula north to Patani or further.

The other form occurring in Peninsular Siam, *S. p. wrayi* Kloss, differs in having the shoulders washed with rufous; it inhabits the rest of the Peninsula from Trang southwards to Kuala Lipis, Pahang (typical locality), except the small area from Central Perak to Selangor inland to, at least, the summit of the main range which is occupied by a form with deep rufous shoulders, *S. p. humei* Bonhote.

For measurements see p. 313.

### 29. *Sciurus concolor concolor*.

*Sciurus concolor*, Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 474 (1855).

1 ♀ ad., 1 ♂ ad., Bang Nara, Patani, Peninsular Siam. 16 July and 3 August 1917. Messrs. Williamson and Smith's collectors [Nos. 2492-3].

This race differs from *S. c. milleri* (antea, p. 20) in being smaller and rather darker in colour, and is without the yellow areas on the sides of the neck, flanks and inguinal region: the tail is only slightly blackened at the tip which is not clearly margined as in *milleri*.

For measurements see p. 313.



30. *Sciurus bocourti bocourti*.

*Sciurus bocourti*, M.-Edw., Rev. Zool., p. 193 (1867).

*Sciurus floweri*, Bonhote, Ann. & Mag. Nat. Hist., (7) vii, p. 455 (1909).

*Sciurus bocourti bocourti*, Kloss, antea, p. 17.

Five examples of this very variable squirrel were given me by H. R. H. the Prince of Chumpon. They all came, I believe, from Bangkok, and I will describe them very shortly to show how greatly the form differs within itself: unfortunately the dates at which they were collected have not been recorded.

No. 2515. ♂ ad. Occiput, nape, back, and basal half of tail above, black, very finely and slightly speckled with white in places; the black extends narrowly down the middle of the upper part of the forelimbs and more broadly over the thighs: crown and distal half of tail above mixed black and white. Remaining parts white.

No. 2516. ♂ ad. Like 2515 but rather more speckled with white above.

No. 2517. ♀ imm. Disposal of colours as in 2516 but back, etc., brownish black finely speckled with rufous: distal three-fourths of tail banded black and rufous throughout with a few white hairs near the tip. Remaining parts white.

No. 2518 ♂ ad. Above ferruginous annulated with black; underparts rufous (burnt sienna); tail proximally ochraceous and black, distally mahogany red.

No. 2519, ♀ ad. Like 2518 but practically without black on the head, fore-limbs and ankles and with the mahogany red of the tail extending along the lower surface to the root.

The last pair have smaller skulls and teeth than the first two specimens but all obviously belong to the same form and are connected by the intermediate example from Sam Kok (antea, p. 17) which has the speckled back of the latter animals and the white muzzle, ears and underparts of the others.

For measurements see p. 313.

31. *Sciurus vittatus miniatus*.

*Sciurus notatus miniatus*, Miller, Proc. Acad. Nat. Sci. Washington, ii, p. 79 (1900).



*Sciurus vittatus miniatus*, Kloss, antea p. 20.

1 ♂ subad. Bang Nara, Patani, Peninsular Siam. 30 June 1916.  
Messrs. Williamson and Smith's collectors [No. 2494].

### 32. *Tamiops barbei kongensis*.

*Sciurus maccllellandi kongensis*, Bonhote, P. Z. S., 1901, p. 54.

*Tamiops barbei kongensis*, Kloss, antea, p. 84.

Skin, without skull, from Lakon Lampang, North Siam. 28 August 1915. Collected by Mr. K. G. Gairdner. [No. 2600].

Bonhote when describing this subspecies pointed out that it possessed both a summer and a winter pelage and on p. 22 of this Journal I described a specimen with short ear-tufts, taken at Muang Prae on April 28th, which was evidently assuming the bright summer phase.

The present specimen is much duller in colour with longer ear-tufts and may be taken as attaining the winter phase. Colour of head, shoulders, limbs and sides greyish, the hairs with pale buffy tips. The two outer pale stripes which run from muzzle to tail are very broad, buffy on the rump, cream on the shoulder and very pale on the head; the inner pair start from the shoulders and are narrow and buff. There are three dark stripes running from the shoulders to tail, all clear black; and the outer yellow stripes are bordered below by a short, broad, indefinite, grizzled, black line. The ears, hands and feet are buffy; the hair on the back of the ears black, that near the tips long with white ends. Throat and under-side of fore-arms greyish, under side of body and hind-limbs buff-yellow to orange-buff. Tail annulated with buff and black, the hairs with buffy-white tips; the extremity black.

The differences in colour between the two phases are largely confined to the upper parts.

Head and body, 101; tail, 117; hindfoot, s.u., 26.

In the dull phase *kongensis* seems hardly distinguishable from specimens from S. Tenasserim which are probably very near true *barbei*. I have seen no topotypes of the latter from Ye but have examined specimens from Tenasserim Town, which are perhaps intermediate between typical *barbei* and *novemlineatus* of Trang,



Peninsular Siam, and the only difference between these squirrels and *kongensis* in dull phase appears to be that the former have the outer yellow stripes rather broader, longer tufts to the ears and tail a little more hoary.

### 33. *Rhinosciurus laticaudatus tupaoides*.

*Rhinosciurus tupaoides*, Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 477 (1855); Robinson and Kloss, Journ. F. M. S. Mus., V, p. 122 (1914).

*Rhinosciurus peracer*, Thomas and Wroughton, Ann and Mag. Nat. Hist. (8), iii, p. 440 (1909); id., Journ. F. M. S. Mus., iv, p. 119 1909.

2 ♀ ad. Bang Nara, Patani, Peninsular Siam. 1 and 2 August 1917. Messrs. Williamson and Smith's collectors [Nos. 2495-6].

Colour above mixed black and ochraceous, blackest along the middle line of the back, yellowest on the sides: underparts white to buffy-white.

One specimen has the tail hairs tipped with whitish, the other with buffy-ochraceous as in the spurious race *peracer*.

The squirrels of this genus are ground animals of dull colouration with remarkably long muzzles: they feed largely on ants and termites and their teeth rapidly wear away owing to the amount of grit they take in with their food: the incisors are always remarkably weak and small, showing that they are not used for gnawing as with most other squirrels.

### 34. *Chiropodomys gliroides*.

*Mus gliroides*, Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 721 (1855).

*Mus pequensis*, Blyth, op. cit., xxviii, p. 295 (1859).

*Chiropodomys (gliroides) pequensis*, Gairdner, Journ. N. H. Soc. Siam, i, p. 253 (1915).

1 ♂ ad. Lat Bua Kao, E. Siam. 22 Sept 1916. Messrs. Williamson and Smith's collectors [No. 2502].

This little soft-furred mouse is Sayal brown above (Ridgway) and white below and has the tail fairly thickly clad with hair posteriorly.

Measurements:—Head and body, 89; tail, 117; hind-foot, s. u., 19; ear, 17. Skull: greatest length, 25.0; condylo-basilar



Measurements of Siamese Squirrels in Millimetres.

Species and Locality.	Sex	Head and Body	Tail	Hind foot s. u.	Ear	SKULL								No.	Remarks
						Great- est length	Condylo- basilar length	Palatal length	Diastema	Upper molar row (alveoli)	Median nasal length	Inter- orbital breadth	Zygo- matic breadth		
<i>Ratufa melanopepla</i> <i>pusillusae</i> Bang Nara, Patani, Peninsular Siam ...	♂	401	404	72	29	68.8	57.2	25.2	14.4	14.0	21.6	26.0	32.0	2486	Adult.
<i>Ratufa melanopepla</i> <i>leucogenys</i> Nong Kha, Sriracha, S. E. Siam ...	♀	...	...	48*	...	75.0†	64.0	29.0	16.2	14.0	23.0	29.8	45.0†	2499	Adult.
<i>Ratufa aureiventer</i> Bang Nara, Patani, Peninsular Siam ...	♂	347	457	70	27	67.0	56.0	26.0	15.0	13.0	21.0	27.8	41.1	2489	Adult.
<i>Ratufa pyrrsonota</i> Bang Nara, Patani, Peninsular Siam ...	...	356	405	66	31	66.0	54.5	26.0	14.7	13.0	22.9	26.7	40.2	2487	Agel.
do do ...	...	...	...	75*	...	66.0†	...	25.0	13.9	12.5	21.4	25.8	40.0	2488	Adult.



Measurements of Siamese Squirrels in Millimetres.

Species and Locality	Sex	Head and Body	Tail	Hind-foot s. u.	Ear	SKULL								No	Remarks
						Greatest length	(condylo- basilar length	Palatal length	Diastema	Upper molar row (alveoli)	Median nasal length	Inter- orbital breadth	Zygo- matic breadth		
<i>Sciurus prevesti prevesti</i> Bang Nara, Patani, Penr. Siam.	♂	265	254	53	21	58.8	50.9	25.0	13.6	11.1	20.3	24.4	35.0	2490	Adult.
do. do. do.	♀	262	223	55	21	58.0	50.0	24.2	13.0	10.6	20.0	23.0	34.4	2491	Young adult.
<i>Sciurus concolor concolor</i> Bang Nara, Patani, Penr. Siam	♂	203	171	43	21	51.0	43.5	22.0	12.0	10.0	15.5	16.8	28.8	2492	Adult.
do. do. do.	♀	213	198	46	..	52.0	44.0	21.3	11.9	9.9	15.0	16.0	28.9	2493	Adult.
<i>Sciurus hooourtii hooourtii</i> Bangkok ? do. do. do.	♂	..	..	45.5*	..	..	..	21.5	11.2	9.9	14.5	18.0	30.0	2515	Adult.
	♂	..	..	45.5*	..	..	..	21.0	11.0	10.2	14.4	18.0	30.0	2516	Adult.
	♂	..	..	..	..	..	..	19.0	10.5	8.9	12.3	17.0	27.5	2518	Adult.
	♂	..	..	..	..	..	..	..	10.7	9.0	11.5	19.0	..	2519	Adult.
<i>Rhinosciurus laticaudatus</i> <i>tupiioides</i> Bang Nara, Patani, Penr. Siam	♀	230	135	45	19	56.5	49.8	28.2	16.1	11.7	20.0	13.1	28.8	2495	Adult.
do. do. do.	♂	225	121	43	20	56.8	50.1	28.2	16.1	12.9	19.4	13.8	27.8	2496	Adult.

\* from dried skin. † approximate.



length, 4.8; palatilar length, 11.2; diastema, 6.8; upper molar-row (alveoli), 4.0; median nasal length, 7.0; interorbital breadth, 4.8; zygomatic breadth, 14.8.

Mr. G. C. Shortridge notes of a large series obtained by him in Tenasserim and recorded by Wroughton as *C. peguensis* (Journ. Bombay. N. H. Soc., xxiii, p. 715, 1915):—"Very plentiful around Bankachon wherever there were bamboos. They never got into traps, even when set among bamboos, but were easy to find as they hid by day, generally singly, occasionally a female and two young, inside the hollow joints of dead bamboos, through one side of which they had bored a circular entrance, about two inches in diameter.

Weight.— $\frac{1}{2}$ -1 oz."

### 15. *Rattus surifer surifer*.

*Mus surifer* Miller, Proc. Biol. Soc. Washington, xiii, p. 148, pl. iv, figs 4, 4a. 4b. (1900).

*Epimys surifer surifer* Kloss, antea, p. 26.

1 ♂ ad. Bang Nara, Patani, Peninsular Siam. 1 Aug 1916 [No. 2498].

1 ♀ ad. Pak Nam Chumpon, S.W. Siam. 7 July 1914. [No. 2551].

Both obtained by Messrs. Williamson and Smith's collectors.

Measurements of No. 2551:—Head and body, 195; tail, 190; hind foot, s. u., 41; ear, 27. Skull:—greatest length, 45.5, condylo-basilar length, 37.5; palatilar length, 18.0; diastema, 12.2; upper molar-row (alveoli) 6.9; median nasal length, 18.0; interorbital breadth, 6.3; zygomatic breadth, 20.0.

### 36. *Nyctocleptes cinereus*.

*Rhizomys cinereus* McClelland, Calcutta Journ. Nat. Hist., ii, 1842, p. 356 (Tenasserim); Wroughton, Journ. Bombay N. H. Soc., xxiii, p. 716 (1915).

*Rhizomys erythrogeus* Anderson, Proc. Asiat. Soc. Bengal, 1877, p. 150; id. Anat. and Zool. Res., p. 324, plate xiii, A. (Salwin Hill Tracts and Tenasserim).

1 ♂ juv., 1 ♀ juv. Mee Taw Forest, Raheng, Central Siam, 2500 ft. 18 December 1913. Mr. C. S. Barton [Nos. 2616-7],

Two very young bamboo-rats with the anterior cheek-tooth only just showing were dug with the mother and three others out of a burrow among the roots of bamboos.



These young examples are very different in colour from adults but they have been in spirit for four years and have perhaps faded a good deal: they are brown above and pale below, the head is pale ferruginous and the darker colour of the nape extends forwards to between the eyes in the form of a **V**.

Head and body, 136,138; tail, 42,41; hind foot, 24,25; ear, 9,10.

### 37. *Acanthion brachyurus brachyurus*.

*Hystrix brachyurus*, Linn. Syst. Nat., i, Ed. 10, p. 57 (1758).

*Acanthion brachyurus*, Kloss, antea, p. 85.

Two foetuses in spirit. Bang Nara, Patani, Peninsular Siam. Mr. C. J. Aagaard (Nos 2609-10).

Entirely naked except for six rows of short bristles on the sides of the snout, a bristle above the eye, another behind and below it, one behind the angle of the mouth, and a couple on the throat.

Length of head and body about 125; tail, 34; hind foot, s.u. 17; ear 7.5.

I understand that these foetuses came from the porcupine recorded on p. 86.

### 38. *Tragulus kanchil fulviventer* > *ravus*.

2 ♂, 1 ♀. Bang Nara, Patani, Peninsular Siam. July 1916. Messrs. Williamson and Smith's collectors. [Nos 2481-3].

These three examples of the Lesser Mouse-deer are intermediate between *fulviventer* Gray, of Singapore and the Malay States, and *ravus* Miller, of Trang, Peninsular Siam: though rather duller than the former they have the nape stripe equally pronounced, whereas in *ravus* it is not so marked.

In mouse-deer the upper canines in bucks take the form of long moveable tushes (about 18 mm) which are represented by very small teeth in the does.

Head and body, 436, 454, 459; tail, 75, 77, 72; hind foot including hoof, 116, 116, 117; ear, 39, 37, 35.

Skulls: greatest length, 94, 92.5,—; condylo-basal length, 86, 85,—; greatest breadth, 41.3, 42.3, 41; maxillary tooth-row excluding incisors (alveoli), 34, 31.5, 33.8.



39. *Bos banteng birmanicus*.

*Bos sondaicus birmanicus*, Lydekker, P. Z. S., 1898, p. 227, pl. xxv.

*Bos banteng birmanicus*, Lydekker, Cat. Ungulate Mammals B. M., i, p. 27, fig. 13, (1913).

*Bos sondaicus porteri* Lydekker, P. Z. S., 1909, p. 669.

*Bos banteng porteri*, Lydekker Cat. Ung. Mamm. B. M., i, p. 28 (1913).

*Bos sondaicus* and *Bos sondaicus porteri*, Gairdner, Journ. N. H. Soc. Siam, ii, p 250 and plate (1917.)

Skull and head-skin of an immature bull from Maa Wong Forest about 80 miles N. W. of Paknampo, Central Siam. Messrs. G. F. W. Elwes and H. C. St. J. Yates [No 2578].

The colour of the skin is pale brownish, irregularly spotted with white throughout, darker above the muzzle and ochraceous on the forehead, neck and outer sides of the ears above; the remainder of the ears, within and without, and the lips are white. Horns black distally, brownish-yellow basally.

Greatest length of skull, 460; external biorbital breadth, 202; upper tooth-row (alveoli) 147 mm.

Greatest breadth across horns, 633; tip to tip, 380; length along outer curve, 495; girth at base 305 mm.

I agree with Gairdner in considering that no sufficient reasons have been advanced for the recognition of the Siamese banteng or tsine as a distinct subspecies (*B. b. porteri*) and have long suspected that, as he now shows, the white spotting which was supposed to distinguish it was merely an instance of aberration.

The same thing occurs among the semi-domesticated banteng of Bali where I have noticed herds which included one or more beasts quite as spotted as the Siamese wild animal figured by Gairdner (type of *porteri*). If, of course, the majority of individuals in a region were thus coloured there might be sufficient reason for admitting a local form, but at present this is not the case, spotted animals being only isolated "sports."

It is possible that such sports indicate the beginning of a progress of evolution and that animals so coloured may eventually become dominant; but we shall have to wait a long time before the use of the name *porteri* becomes thus justified — unless Siamese animals happen to possess peculiar characters which have not yet been perceived.



I therefore use the name of the Burmese animals which, though old bulls *do* attain a blackish coat\*, seems to differ from the typical race in a lesser development of the white rump patches.

Notwithstanding Butler's† and Lydekker's‡ identification of the female skull of some kind of ox from Perak as a banteng, there is no real proof of the existence of the species in the Malay States: a great number of horns and frontlets obtained by Europeans and Malays have been seen, but all are unquestionably those of gaur or sêladang: undoubtedly if the banteng occurred, trophies of it would have been noticed among them. The distribution is therefore parallel with that of several other animals and some birds, i. e., the species occurs in Indo-China and one or other of the Malay Islands but skips the Peninsula.

\*                      \*                      \*                      \*                      \*

The following corrections are required in my previous papers on mammals in this volume:—

- p. 5, line 5: *for* *osbeura* *read* *obscura*
- p. 5, „ 6: „ *female* *read* *male*
- p. 30, last line: „ *type* *read* *types*
- p. 31, measurements of *Tamias rodolphi* should read:—median nasal length, 8.0 *and* interorbital breadth, 10.7.
- p. 34, line 21: *for* *measurement* *read* *measurements*
- p. 80, „ 25: *between the* *and* *fruit-bats* *insert* *continental*.
- p. 83, „ 23: *for* 17 *read* 18
- p. 216, „ 33 „ *description* *read* *description*
- p. 236, on plate opposite: *for* ♂ *read* ♀, *and* *for* *mammal* *read* *mammæ*.
- p. 242, on plate opposite *for* fig. 7 *read* fig. 6.
- p. 242, „ „ „ „ „ „ fig. 6 *read* fig. 7.
- p. 243, line 1: *delete* of the

\* *Vide* Evans, who also says that young bulls often have white spots on their flanks which in course of time merge into each other and turn a dirty grey (*Big Game Shooting in Upper Burma*, pp. 81-3; 1911)

† *Bos sondaicus*, Malayan form, Butler, Journ. Bombay N. H. Soc, xiii, p. 192, plate (1909).

‡ *Bos sondaicus butleri* Lydekker, Field, cv, p. 151 (1905); id., Game Animals of India, p. 75 (1907); id., Cat. Ung. Mamm. B. M., i. p. 29 (1913).



- p. 247, line 10 *for* throughout *read* throughout  
p. 247, „ 10 „ crab eating *read* crab-eating  
p. 247, „ 22 „ natural *read* neutral  
p. 249, „ 8 „ *resimal* *read* *resima*<sup>1</sup> and refer  
to it the footnote on p. 248.



# THE BIRDS OF BANGKOK.

By W. J. F. WILLIAMSON, F.Z.S., M.B.O.U.

(Continued from Vol. II, No. 3, p. 214).

With the Part published in the previous number of the Journal, the Passerine birds, comprising about 40 per cent. of the total number to be described in this Paper, were completed. For the remaining Orders the same general plan will be followed, as hitherto, except that trinomial designations will be used in all cases where it appears that the birds may properly be assigned subspecific rank. The plan of putting an asterisk (\*) before the names of birds which were not mentioned in the Preliminary List published in 1914 (Vol. i, pp. 41 to 48 of this Journal), will also be discontinued. This arrangement is no longer convenient, in view of the length of time which has elapsed since the List was prepared, and the considerable additions made to it. Further, as a synonymy is now being given, the references to the Fauna of British India—Birds, will be quoted therein, instead of being noted by means of numbers in brackets after the serial numbers in this Paper.

## ORDER—**PICI.**

### Family *PICIDÆ*—Woodpeckers.

Siamese (general name), นกหัวขวาน—Nok hua-khwan.

68. *Gecinus vittatus eisenhoferi* (Gyld.). *The Siamese Scaly-bellied Green Woodpecker.*

*Gecinus vittatus* (part.), Robinson and Kloss, Ibis, 1911, p. 45; Robinson, Ibis, 1915, p. 738.

*Picus vittatus eisenhoferi*, Gyldenstolpe 1916, p. 88.

*Gecinus vittatus eisenhoferi*, Robinson, Journ. F. M. S. Mus., vii (1917), p. 164.

*Description.* Length about 305 mm. (12 in.). Toes 4. Crown and occipital crest crimson in male, black in female; back, scapulars, wing-coverts and upper tail-coverts, olivo-green; rump yellowish green; a greyish white superciliary streak, bordered with black above, continuing to behind the eye—the black bordering extending forward to



the base of the forehead; lores, cheeks and ear-coverts greyish to brownish white; malar band black, streaked with white; primaries dark brown with whitish spots on both webs; secondaries and tertiaries dark brown on inner webs, olive-green on outer webs—both these sets of wing-feathers having white spots on inner webs, and the secondaries usually with traces of the same on outer webs also; tail-feathers sometimes brown but usually brownish black, imperfectly barred on the basal half with light brown. Chin, throat and upper breast mustard-yellow, usually paler on the first two parts; lower breast, abdomen and flanks dull greenish or yellowish white, each feather margined with dark green, giving a striped appearance; lower tail-coverts similar, but darker.

Iris dull red. Upper mandible and tip of lower dark brown to blackish, remainder of lower mandible greenish yellow. Legs dusky green. Claws horn-colour.

*Distribution.* This is the bird which I have wrongly recorded [Journ. N. H. S. Siam, i, p. 197 (1915)] as *Gecinus viridanus*. The present subspecies is based on a female obtained by Gyldenstolpe at Pa Hing, in Northern Siam, and differs from the true *G. vittatus*, which occurs in Java, Sumatra and Malaya, chiefly by its larger size. Robinson records two specimens obtained by Kloss in South-eastern Siam, in which part of the country I have likewise procured it. My collection also includes specimens from Pak Jong and Muak-lek in Eastern Siam, from Bangkok and Ayuthia in the Central division of the country, and from Hua Hin and Nong Kae in South-western Siam. It thus appears to be a widely distributed bird. In my specimens the wing ranges from 132-143 mm. in length. According to Robinson (*op. cit.*, 1915) the present form of this Woodpecker is quite cut off from the true *G. vittatus*, as the species inhabiting the Siamese portion of the Malay Peninsula, from about Trang or Bandon northwards, is the allied but perfectly distinct *G. viridanus*. If this is so, *G. vittatus eisenhoferi* is probably approaching the southern limit of its range at Nong Kae.

My one Bangkok specimen was shot at Wat Thong Insri, on the bank of the Chao Phya river, about 3 miles due south of Sathorn Road, on 20th January 1914.



*Habits, &c.* This Woodpecker, as well as *Micropternis brachyurus burmanicus* and *Tijda javanensis intermedia* (vide pp. 322 and 323), are, I believe, only to be found, and that sparingly, in the better-wooded parts of the environs of Bangkok, such as in the extensive areas under fruit-garden cultivation, in large Temple grounds (where shooting cannot be indulged in), and in certain narrow belts of trees on the banks of the main river and some of the canals.

69. ***Dendrocopus pectoralis*** (Blyth.) *The Spotted-breasted Pied Woodpecker.*

*Dendrocopus pectoralis*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 41; Williamson, Journ. N. H. S. Siam, i, p. 45 (1914).

*Description.* Length 178 mm. (7 in.). Toes 4. Forehead brownish white. Crown, in male more or less crimson, in female black; sides of face and neck white; ear-coverts white to brownish; a black malar band on each side from the base of the lower mandible to the side of the neck; nape and hind neck black, all the rest of the upper plumage barred with black and white; quills dark brown, with white spots on both webs; tail-feathers blackish, with elongate white to fulvous white spots on both webs, forming incomplete bars; chin and throat white, breast and abdomen pale brownish, the former distinctly spotted with dark brown, the latter indistinctly, with pale brown; flanks barred brown and whitish; vent and under tail-coverts spotted with brown and tinged with reddish pink.

Iris dark brown. Upper mandible blackish, base paler; lower mandible slate colour, tip dusky. Mouth slate colour. Legs dark plumbeous, soles somewhat paler and with dull yellowish green tinge. Claws dark horn-colour.

*Distribution.* So far as this country is concerned, apparently only recorded up to the present from Bangkok, Central Siam. The general distribution of this species is peculiar. According to Blanford, it occurs in Pegu, which is in about the same latitude as Northern Siam, and in certain other parts of Burma, but not in Tenasserim. It is also found in Cochin-China, and in Java and Sumatra, but apparently not in British Malaya—vide Robinson, Hand-list, Birds Malay Peninsula (1910), p. 11, note to No. 310.



The bird is evidently, therefore, of very local distribution, and it will be interesting to see if it is eventually found in any other part of Siam.

*Habits, &c.* In Bangkok this is a common bird, and freely enters the gardens round houses. Its presence may, usually, be at once detected, either by its note of *chik, chik* (or, more occasionally, a rapid *chr-chr-chr*), or by the very quick tapping noise which it makes with its bill, as it seeks to dislodge insects from their places of concealment under loose bark, or in the dead wood of trees, &c. I have also occasionally seen it clinging to one of the wooden posts carrying the electric light wires on the sides of the roads in my neighbourhood, tapping away vigorously—the insects for which it was in search being presumably concealed in the longitudinal cracks in the posts.

On two occasions I have had eggs brought to me, which I believe to be of this bird, in January and May, respectively. It must, of course, breed here regularly.

70. *Micropternus brachyurus burmanicus* Hume. *The*  
*Pegu Rufous Woodpecker.*

*Micropternus burmanicus*, Hume, Proc. Asiat. Soc. Bengal, 1872, p. 71.

*Micropternus brachyurus* (part.), Blanford, Faun. Brit. India, Birds, iii (1895), p. 57.

*Micropternus phaeocephs*, Williamson, Journ. N. H. S. Siam, i, p. 198.

*Micropternus phaeocephs phaeocephs*, Gydenstolpe 1913, p. 48; id. 1916, p. 94.

*Description.* Length about 235 mm. (9½ in.). Toes 4, first very short. *Male.* The whole plumage dull rufous (occasionally light chestnut); top of the head and occiput tinged with dusky brown, the feathers slightly paler at the edges—those of the chin and throat with much more distinct pale edges; feathers beneath the eye and for a short distance backwards and forwards tipped with crimson; back, rump, upper tail-coverts, wings and tail with black transverse bars, which, however, are sometimes wanting on the back. Lower surface rather duller in colour than the back, and without black bars except on the flanks, thighs and under tail-coverts. *Female.* No crimson below the eyes. *Immature birds.* Crescentic dark brown marks on the lower surface, which become paler and tend to disappear as the birds arrive at maturity.



Iris brown. Bill very dark brown, plumbeous at base of lower mandible. Mouth dusky flesh. Legs greyish brown. Claws horny.

*Distribution.* The race of the Rufous Woodpecker found in Siam—at all events from Bangkok northwards—appears to be the one which Hume described from Thayetmyo, Pegu. It is intermediate between the larger and paler northern form, *M. b. platiceps*, and the darker and smaller southern race, *M. b. brachyurus*, the distinguishing characteristics of which are given by Blanford (*op. cit.*, p. 55) in his key to the three Indian "species" of this genus then recognised. The author mentioned admits that they are "merely geographical races, separated by very slight characters, and tending greatly to pass into each other." This being the case, they must all, according to the law of priority, be described as subspecies of *brachyurus*, which is Vieillot's name dating from 1818, whereas *platiceps* (of which the spelling was subsequently changed to *plateiceps* by Hume) was adopted by Blyth, only in 1815. I have birds from Northern, Eastern and Central Siam among which there are specimens from each of those divisions, which might be assigned to either group, if Blanford's test be applied,

As regards size, the wing-measurements of my birds vary from 120 mm., in specimens from Bangkok and Samkok, Central Siam, to 131 mm. in one from Meh Lem, in the Northern division of the country. It may also be noted that, of a pair obtained with one shot at Ayuthia, the wing of the male is 120 mm., while that of the female is 130 mm. The longest wing-measurement given by Gyldenstolpe is 127 mm.

My one Bangkok specimen (a male) was obtained near Klong Toi on 14th June 1915.

# 71. *Tiga javanensis intermedia* Blyth. *The Golden-backed Three-toed Woodpecker.*

*Tiga javanensis* (part.), Blanford, Faun. Brit. India, Birds, iii (1895), p. 61; Ogilvie-Grant, Fasc. Mal. Zool., iii (1905), p. 99; Robinson and Kloss, Ibis, 1911, p. 47; Gyldenstolpe 1913, p. 49; Williamson, Journ. N. H. S. Siam, i, p. 198.

*Tiga javanensis intermedia*, Gyldenstolpe 1916, p. 95.



*Description.* Length about 290 mm. (11.4 in.). Toes 3. Crown and occipital crest red in the male, black, with elongate sub-terminal spots on each feather, in the female; sides of head and neck white, except a broad black band from the eye to the nape, and another, sometimes mixed with white, from the malar region to the shoulder; hind neck and top of back black; back, scapulars and wing-coverts golden olive, often with orange or scarlet edges to the feathers; rump and lower back crimson; upper tail-coverts brown to blackish; outer webs of secondary quills golden olive, duller than back, rest of quills dark brown with white spots on inner webs—the tips of the primaries pale brown to whitish; tail black. Lower parts buffy white, sometimes with rufous tinge on chin and breast; a broken black stripe down the middle of the chin and throat, getting broader below; feathers of breast and abdomen with broad black edges, so as to produce a scale-like pattern; flanks and lower tail-coverts barred black.

Iris dark brown. Upper mandible and terminal half of lower, dull black; remainder of lower mandible bluish slate. Mouth bluish slate. Legs dusky green. Claws horn-colour.

*Distribution.* The long-winged race of this Woodpecker has been reported from Northern and Central Siam, and from Kok Lak in South-western Siam. In addition, I have obtained it at Muak-lek and Lat Bua Khao, in the Eastern division of the country, and at Sriracha, in South-eastern. A female (with a wing of 133 mm.) which my collector procured at Bangnara, Patani, in the extreme south of the Siamese portion of the Peninsula, is, however, referable to the short-winged southern form, *T. j. javanensis*.

My single Bangkok specimen (♀) was shot at Wat Thong Insri, on the left bank of the river about 3 miles south of Sathorn Road, on 6th February 1915.

## 72. *Iynx torquilla* Linn. *The Wryneck.*

*Iynx torquilla*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 78; Gyldenstolpe, Journ. N. H. S. Siam, i, p. 230 (1915).

*Description.* Length 191 mm. (7.5 in.). Above brownish grey, finely speckled and mottled; a dark brown patch, unevenly coloured, from the nape to the middle of the back, another across the coverts of each wing, a few longitudinal dark streaks on the lower back, and



some imperfect ocelli on the wing-coverts; quills brown with rufous spots on the outer, and paler ones on the inner webs; tail with narrow wavy black cross bands; sides of head, throat, foreneck and upper breast pale rufous, with dark narrow cross-bands; a dark patch on the ear-coverts; lower breast and abdomen whitish, with arrow-head shaped dark marks.

Iris hazel. Bill brown. Legs and feet greenish brown (Oates).

*Distribution.* The only specimen so far recorded from Siam is that listed by Gyldenstolpe as having been obtained by Mr. Emil Eisenhofer in Northern Siam. I subsequently procured one (♂) in Bangkok, on 24th April 1916, sitting on a small tree near the railway crossing over Klong Toi. Unfortunately I omitted to note the colours of the soft parts, the particulars of which, as given above, are as recorded by Blanford. The bird is said by Blanford to be a winter visitor to the plains of India and Burma, but is evidently a rare one to Siam. It is not reported from French Indo-China by Oustalet, nor does it appear in Robinson's Hand-list of the Birds of the Malay Peninsula (1910).

## ORDER—**ZYGODACTYLI.**

Family *CAPITONIDÆ*—Barbets.

### 73. *Xantholaema haematocephala* (P. L. S. Müll.)

*The Crimson-breasted Barbet.*

Siamese, นกคอกง—Nok ti-t'hong.

*Xantholaema haematocephala*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 98; Ogilvie-Grant, Faun. Malay. Zool., iii (1905), p. 101; Robinson and Kloss, Ibis, 1911, p. 44; Gairdner, Journ. N. H. S. Siam, i, p. 149 (1915); Robinson, Journ. F. M. S. Mus., v, p. 95 (1915); Gyldenstolpe 1916, p. 101; Robinson, Journ. F. M. S. Mus., vii, p. 165 (1917).

*Description.* Length up to 171 mm. (6.75 in.). Lores black; forehead and snicuput crimson; a black band across the vertex extending down each side of the head behind the eye to the malar region; occiput and sides of neck greyish green; remainder of upper parts yellowish green; quills blackish, the primaries (except the first two) narrowly, the remaining wing-feathers more broadly, edged on the outer webs with green, and all the quills with paler edges on the inner webs especially towards their bases; a broad supercilium and a still



broad streak below the eye, with the chin and throat, sulphur-yellow; breast, abdomen and under tail-coverts yellowish white, streaked longitudinally with dark green, especially on the flanks; tail faintly washed below with pale verditer-blue.

The young is duller, and lacks the crimson and black on the foreneck.

Iris dark brown. Bill blackish, except base of lower mandible which is slate-colour. Mouth slate-colour. Bare orbital skin dull crimson. Legs pinkish coral-red to lake-red. Claws blackish in adults.

*Distribution.* A very widely distributed bird, and common nearly everywhere. The authors quoted in the synonymy record this species from all parts of the country except the Central, Eastern and South-eastern divisions, in all three of which, however, I have personally obtained it.

*Habits, &c.* In Bangkok this is one of the best-known and most familiar birds, under its trivial name of Coppersmith, which it derives from the supposed resemblance of its monotonous note, *took, took, took*, to the tap of a hammer on metal. This note it repeats times without number from its perch on the upper branches of some leafy tree, and at each note it nods its head. The Siamese name, it is of interest to remark, means "Gold-beater bird," while the Malays call it *Tukany besi*, or the "Blacksmith" bird.

This Barbet, in common with most other Eastern species of the family, is mainly a fruit-eater, but is said occasionally to take insects. Any large trees which bear an abundance of small-sized fruits, such as *Ficus elastica*, the common Rubber tree of Bangkok, and *F. religiosa*, the *Tou Pho* of the Siamese, are a great attraction to these birds at certain seasons.

## ORDER—ANISODACTYLI.

### Family CORACIADAE—Rollers.

#### 74. *Coracias affinis* McClell. *The Burmese Roller.*

Siamese, นกตะกราม—Nok ta-khām.

*Coracias affinis*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 105; Ogilvie-Grant, Fasc. Malay. Zool., iii (1905), p. 109; Gyldenstolpe 1913, p. 51; Gairdner, Journ. N. H. S. Siam, i, p. 150 (1915); Gyldenstolpe 1916, p. 117.

*Description.* Length about 330 mm. (13 in.). Head above



greenish blue to bluish green, passing into bright pale verditer-blue on the broad and long supercilia; back, scapulars and tertiaries dull brownish green to greenish brown; smaller and median coverts dark blue, greater secondary coverts greenish blue, greater primary coverts pale blue; quills deep blue, with a bar of pale blue across the terminal half of the primaries; rump deep blue; upper tail-coverts bright pale blue; middle tail-feathers dusky bluish green, the others deep blue at the base and light blue on the terminal portion, with the ends tipped darker; sides of head, chin and throat purplish blue, the throat-feathers with shining blue shaft-stripes; breast and abdomen vinaceous brown (in some specimens with slight purplish gloss) passing on lower abdomen into dusky and then light blue on vent and under tail-coverts; wing-lining dark purplish blue.

Iris brown. Bill blackish. Mouth pale lemon-yellow. Edges of eyelids and bare facial skin brownish or greenish yellow to dull yellowish orange. Legs yellowish brown to brownish yellow. Claws blackish.

*Distribution.* The authorities quoted in the synonymy record this bird from the Northern, Western and Peninsular divisions of the country, while I have also obtained it at Bangkok, Central Siam, and at Nong Khor, near Sriracha, in the South-Eastern division. As it has been reported from Indo-China by Oustalet, it is almost certain to be found, as well, in Eastern Siam, so it may be said to be widely distributed throughout the country.

In this connection it is of interest to note that, though this bird occurs as far down the Malay Peninsula as Patani (the southernmost Province of Siam), it has not yet been observed in British Malaya.

*Habits, &c.* In Bangkok the Burmese Roller (frequently called the Blue Jay by Europeans) is a common resident species. It is a solitary bird, except during the breeding season (which is in the hot weather) and is usually to be seen seated motionless on some exposed position, such as the uppermost branch of a tree, an electric light cable on the roadside, or a post in a garden, but also, not infrequently, on a bund in a padi-field or on a heap of earth or stones. Its flight is, ordinarily, a slow and steady flapping, not unlike that of the Crow, but, in common with its Indian congener (*C. indica*), it has, as remarked by



Jerdon, quoted by Blanford (*op. cit.*, p. 104), "the habit of occasionally making sudden darts in the air in all directions" at a rapid pace. I have only observed these darting flights during the breeding season, so they are probably made for the purposes of display, and the bird then shows that it possesses considerable wing-power, contrasting strikingly with its usual quiescent habits.

The Roller is generally rather a silent bird. Its ordinary note (which is always heard more frequently in the breeding season) is a short and harsh *cheh, cheh*, which is uttered both when at rest and while on the wing. It also has a louder screaming cry of *che-eh, che-eh, che-eh*, always produced while on the wing and very often when performing the aerial evolutions referred to above.

### Family *MEROPIDÆ*—Bee-eaters.

Siamese (general name), นกขี้ผึ้ง—Nok khab-khā.

#### 75. *Merops philippinus* Linn. *The Blue-tailed Bee-eater.*

*Merops philippinus*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 111; Ogilvie-Grant, Fasc. Malay. Zool., iii (1905), p. 109; Robinson and Kloss, Ibis, 1911, p. 37; Gairdner, Journ. N. H. S. Siam, i, p. 150 (1915); Robinson, Journ. F. M. S. Mus., v, p. 146 (1915), and vii, p. 152 (1917).

*Merops superciliosus philippinus*, Gyldenstolpe 1916, p. 110.

*Description.* Length up to 305 mm. (12 in.), of which the tail is 152 mm. (6 in.). Lores and a streak past the eye to the ear-coverts black, bordered above by a narrow pale verditer-blue supercilium and below by a broader blue line. Upper parts to rump, including the wing-coverts, green with a rufous tinge, passing into the verditer-blue of the rump, upper tail-coverts and tail; tertiaries sometimes bluish, and sometimes green with bluish tips and edges; middle pair of tail-feathers with long elongate black tips, and all the tail-feathers darkish grey beneath; wing-feathers (except the tertiaries) darker and more rufous green than the back, and tipped with black; chin yellowish; throat chestnut, passing into green on the breast, into greenish blue on the abdomen, and then into pale blue on the vent and under tail-coverts; wing-lining light brownish rufous.

Iris crimson. Bill black. Mouth flesh-colour. Legs dark pur-



plish brown, soles paler. Claws blackish.

*Distribution.* So far recorded from Northern, Central, Western and Peninsular Siam, while I have also obtained it at Muak-lek in the Eastern part of the country, in April, and at Cape Liant, in South-eastern Siam, in October. It is thus universally distributed.

*Habits, &c.* I have records of this Bee-eater in Bangkok in all months ( of different years ) except May, when it also doubtless occurs. Nevertheless, the bird is a partial migrant, and presumably wanders about the country as food supplies wane or increase in particular localities. It is sometimes in Bangkok for weeks at a time and then disappears suddenly, to return again a few weeks later. The bird is, perhaps, less often seen in the hot weather, when it is probably away breeding.

The Blue-tailed Bee-eater is a handsome and familiar bird, and may often be seen seated on an electric light wire, an exposed twig of a tree, or other point of vantage, whence it swoops after some passing insect, or makes a short flight in the air for amusement, returning, as a rule, to the same perch. Frequently, several of them are found together. Their general mode of flight consists of a few rapid beats of the wings, followed by a graceful sailing motion, with wings outstretched. The note (always, I believe, uttered while on the wing) is a rather melodious rolling one, *crui, crui, crui*, repeated several times.

#### Family *ALCEDINIDAE*—Kingfishers.

Siamese (general name), นกกระเต็น—Nok kra-ten.

76. *Ceryle rudis leucomelanura* Reichenb. *The Eastern Pied Kingfisher.*

Siamese, นกกระเต็นปากดำ--Nok kra-ten pāk lāk.

*Ceryle varia*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 119; Williamson, Journ. N. H. S. Siam, i, p. 45 (1914); Gairdner, Journ. N. H. S. Siam, i, p. 150 (1915).

*Ceryle rudis leucomelanura*, Gyldenstolpe 1913, p. 53; id. 1916, p. 114.

*Description.* Length about 279 mm. (11 in.). Crown, nape and small nuchal crest black, sparingly streaked with white; lores and a long supercilium white; a black eye-streak from the base of the bill to the ear-coverts, connected by a narrow black band with the black gorget; an imperfect white collar; back, scapulars and wing-coverts



black, with white edgings to the feathers : rump-feathers mixed black and white : primaries white at base, black at terminal end—the white on the inner webs of the outer primaries being extended diagonally across the distal half ; secondaries largely white, with irregular black markings, mainly on the outer webs ; all wing-feathers, except the first few primaries, with white tips ; tail-feathers white on the basal half and on the tip, a broad black band occupying the greater part of the distal half. Lower plumage, with cheeks and wing-lining, white, some small elongate black spots forming a malar patch : a broad gorget across the breast (interrupted in the middle, in the female) and some black spots on the flanks, sometimes nearly meeting across the abdomen. The white on the throat, breast and abdomen is very pure and glossy.

Iris brown. Bill black. Mouth flesh-colour. Legs and feet blackish. Claws black.

*Distribution.* Recorded, up to the present, only from Northern, Central and Western Siam. Gyldenstolpe remarks (*op. cit.*, 1916) that south of the latitude of Bangkok "it seems to be extremely rare, though it is found here and there in suitable places." I am not aware on what grounds the latter part of this statement is based, as no such occurrences appear to have been reported.

*Habits, &c.* I have obtained or observed this Kingfisher in Bangkok in all months of the year except June, November and December, but it probably sometimes occurs in these months also. So far as Bangkok is concerned, it is, however, a partial migrant, and comes and goes irregularly. When present, the bird cannot fail to be observed, both on account of its conspicuous black and white plumage, its frequently uttered twittering cry, and its habits, which tend to make it a familiar bird.

This is the only Kingfisher, occurring in Bangkok, which does not habitually watch for its prey from a fixed perch. Its ordinary method is to hover over the water, when it sees or suspects a fish, with its body horizontal, head bent down and beak vertical, and wings beating the air rapidly. From this position it plunges, head foremost, quite vertically—the first yard or two of its descent of 20 or 30 ft. being



aided by a stroke or two of the wings, to gain impetus, but before the water is reached the wings are closed. The momentum carries the bird right under the water, but it is out again in a second with (if success has been achieved) a small fish in its bill, held at right angles. It then, while still flying, drops the fish in the air for a moment, only to re-seize it instantly, by the head, and swallow it. I have seen this done several times. If the fish for which it is darting disappears after the bird commences plunging, it checks its downward course before reaching the water, and flies upward again.

The Pied Kingfisher is, of course, often to be seen seated on trees, stumps or posts near the water, but I have never observed it plunge from these. When uttering its twittering cry, while seated, it has the habit of flicking its tail up.

77. *Alcedo ispida bengalensis* Gm. *The Eastern Common Kingfisher.*

*Alcedo ispida* (part.), Blanford, Faun. Brit. India, Birds, iii (1895), p. 122; Williamson, Journ. N. H. S. Siam, i, p. 45 (1914):

Ogilvie-Grant, Fasc. Malay. Zool., iii (1905), p. 111.

*Alcedo bengalensis*, Robinson and Kloss, Ibis, 1911, p. 32.

*Alcedo ispida bengalensis*, Gyldenstolpe 1913, p. 54; Robinson, Ibis 1915, p. 730; Gyldenstolpe 1916, p. 115; Robinson, Journ. F. M. S. Mus., vii, p. 146 (1917).

*Description.* Length up to 171 (6.75 in.). Crown and nape transversely banded black and blue: lores and a band below the eye to the ear-coverts deep ferruginous, ending in a white (or slightly rufous white) patch at the side of the neck: lower edge of the lores black, and sometimes a black spot at the base of the lower mandible, whence there is a broad blue stripe along the cheek: middle of back, rump and upper tail-coverts bright blue: scapulars and wing-coverts greenish blue, each of the lesser and median coverts tipped with a bright blue spot: quills brown, edged outside with greenish blue: tail blue above, brown beneath. Chin and throat white, sometimes with a pale ferruginous wash: remainder of lower parts deep ferruginous. The intensity and shade of the blue varies to some extent.

Iris very dark brown. Bill blackish throughout in males; in females the lower mandible is orange at the base and dusky at the tip. Mouth livid flesh to fleshy orange. Legs coral-red, sometimes dusky in front. Claws pale to dark horn.



*Distribution.* So far recorded from Northern, Central, South-eastern and Peninsular Siam, while Gairdner (Journ. N. H. S. Siam, i, p. 150) believes he has seen it in the Western division of the country. The bird thus remains to be recorded only from Eastern Siam, but as Oustalet has reported it from French Indo-China, it may with certainty be regarded as a species distributed throughout the country in suitable localities.

*Habits, &c.* In Bangkok this little Kingfisher is a winter visitor, and I have observed it from the end of August to the end of March, *i. e.*, for a space of about 7 months. As it is resident in the country, it apparently moves away, after the hot season sets in, for breeding purposes.

This Kingfisher is a small edition of the common European one, and has similar habits. As far as my observation goes, it is usually a solitary bird, and may often be seen sitting quietly on some low twig over-hanging the water, or on a post or other near-by convenient coign of vantage, ready to plunge for an unsuspecting small fish. It is also said by Blanford occasionally to take tadpoles or water-insects. Its flight, as Blanford observes, is swift and straight, generally just above the surface of the water, and I have observed that, when so flying, it frequently utters its sharp, quick note of *chi-chi-chi-chi-chi*, followed by *chi, chi, chi*, two or three times, more slowly.

#### 78. *Ceyx tridactyla* (Pall.). *The Indian Three-Toed Kingfisher.*

*Ceyx tridactyla*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 127; Ogilvie-Grant, Fasc. Malay. Zool., iii (1905), p. 111; Robinson and Kloss, Ibis, 1911, p. 33; Herbert, Journ. N. H. S. Siam, i, p. 118 (1914); Robinson, Journ. F. M. S. Mus., vii, p. 146 (1917).

*Ceyx tridactylus*, Gyldenstolpe 1913, p. 54; id. Journ. N. H. S. Siam, i, p. 231 (1915).

*Description.* Length up to 140 mm. (5.5 in.). A spot at base of forehead, pointed behind, black washed with purple; crown, nape, hind neck, lower back and upper tail-coverts orange-red with a ruddy violet gloss, especially over the eye and on the rump and upper tail-coverts; a black spot before the eye; lores, cheeks, ear-coverts and lower parts from the throat orange-yellow; chin and throat whitish; a deep blue spot behind the ear-coverts, bordered behind by white;



scapulars and inter-scapular region dark purplish blue; wing-coverts edged with deep blue; quills dark brown, outer web of first primary entirely, and inner webs of all wing-feathers partially, dull rufous; edge of wing, smaller upper coverts and under wing-coverts rufous; tail orange-red.

Iris brown. Bill and feet bright vermillion-red (Blanford).

*Distribution.* Recorded, so far, from Peninsular, Northern and Central Siam, the first being the only division of the country in which the bird appears to be at all plentiful. Robinson and Kloss state that *C. tridactyla* is "widely distributed throughout the Peninsula in heavy jungle, usually near water," and Robinson has informed me that it is common in Trang. As regards the other parts of the country, the only records I can trace are the following:—

One obtained by Mr. P. A. R. Barron at Koh Si-chang, Inner Gulf of Siam, in 1912 and preserved in spirit (Gyldenstolpe, *op. cit.*, 1913). Mr. Barron informed me that this specimen dropped dead in his compound, while flying overhead.

One caught alive by some boys in a garden near Bush Lane, Bangkok, on 7th April 1914, and brought to Mr. E. G. Herbert, who put it into his aviary. Here it lived for two months, feeding on small prawns, until it succumbed during a heavy thunderstorm (Herbert, *loc. cit.*).

One obtained by Mr. Emil Eisenhofer in Northern Siam (Gyldenstolpe, *op. cit.*, 1915). Mr. Eisenhofer informed me that it was a solitary specimen, and was shot near Den Chai.

One procured by H. R. H. the Prince of Chumpon at Muang Nón, near Bangkok, a year or two ago.

From the above particulars it is evident that the bird is rare in what may be called Siam proper, and a further point to be noted is that in none of the four examples reported can it be said that the birds were found in "heavy jungle," which Robinson and Kloss mention as their habitat in the Malay Peninsula. Koh Si-chang is certainly well-wooded in parts, but not heavily timbered, while the jungle round Den Chai is deciduous and rather open. In the other two cases the specimens were obtained in garden land, on the alluvial plain of Central Siam.



79. *Pelargopsis guriel burmanica* Sharpe. *The Burmese Stork-billed Kingfisher.*

Siamese. นกกระเต็นใหญ่ or นกก้าม—Nok kra-ten yai, or Nok kam kuam.

*Pelargopsis guriel* (part.), Blanford, Faun. Brit. India, Birds, iii (1895), p. 129; Williamson, Journ. N. H. S. Siam, i, p. 45 (1914); Gairdner, *ibid.*, p. 150 (1915).

*Pelargopsis guriel burmanica*, Gyldenstolpe 1913, p. 54; Robinson, *Ibis*, 1915, p. 731; Gyldenstolpe 1916, p. 114.

*Description.* Length about 356 mm. (14 in.). Crown, nape and sides of the head, including the cheeks and the ear-coverts greyish brown. Neck all round and lower parts, including wing-lining, brownish yellow of varying shades—the chin and throat usually paler and the breast darker; upper back, scapulars, outer webs of quills, longer tail-coverts and tail dull greenish blue—the colour on the wing- and tail-feathers usually bluer; primaries (except the outer webs towards the base), inner webs of secondaries, and lower surface of tail brown: back, rump, and shorter tail-coverts bright blue.

Iris brown. Bill dark blood-red, paler below and dusky at tip. Edges of eyelids pinkish orange. Legs coral-red. Claws horn-colour.

*Distribution.* This race of the Stork-billed Kingfisher has been recorded from all the divisions of the country except Peninsular Siam, where it is apparently replaced by the allied form, *P. guriel* (or *capensis*) *malaccensis*, which is slightly smaller and with some differences in colouration. Robinson found birds from Koh Pennan, off Bandon, intermediate between the two races, but nearer to the Malay-an form.

*Habits, &c.* This is the largest of our local Kingfishers and is a resident bird. It is not uncommon in the better-wooded parts of the suburbs, and, so far as I have observed, is always solitary. It has a loud cry, uttered while flying, of *ka-a ka, ka-a ka, ka-a ka*, repeated rather slowly several times, and with a rising inflection on the second syllable of the first note.

80. *Halcyon smyrnensis fusca* (Bodd.). *The White-breasted Kingfisher.*

*Halcyon smyrnensis* (part.), Blanford, Faun. Brit. India, Birds, iii (1895), p. 132; Ogilvie-Grant, Fasc. Malay. Zool., iii (1905), p. 110; Robinson and Kloss, *Ibis*, 1911, p. 34; Williamson, Journ. N.



H. S. Siam, i, p. 45 (1914); Robinson, Journ. F. M. S. Mus., v., pp. 92 and 145 (1915).  
*Halcyon smyrnensis fusca*, Gyldenstolpe 1913, p. 54; Robinson, Ibis, 1915, p. 732; Gyldenstolpe 1916, p. 116.

*Description.* Length about 267 mm. (10.5 in.). Chin, throat and middle of breast white, all the rest of the head, neck and lower plumage deep chestnut-brown; scapulars and inter-scapulary tract, tertiaries, outer webs of secondaries above, and upper surface of tail blue, usually with a greenish tinge in certain lights; lower back, rump and upper tail-coverts brighter blue; greater wing-coverts duller and darker blue; median coverts black; lesser coverts chestnut; secondary quills black, except on the upper surface of the outer webs; primaries blackish brown, with the basal portions above pale blue and a white patch on the inner webs.

Iris brown. Bill dark sealing-wax red, sometimes dusky at the tip, the base and the edges of the mandibles. Eyelids dull pinkish brown. Legs and feet bright sealing-wax red behind, reddish brown in front. Claws dark horn-colour.

*Distribution.* Has been recorded from all the divisions of the country, except the Western, but must occur there also.

*Habits, &c.* In Bangkok I have only observed this bird from September to February, so it would appear to be a partial migrant, leaving this neighbourhood for some other part of the country for breeding purposes. According to Blanford the Indian bird breeds from March to July, and it is probable that the Siamese one does so at the same time of the year. It is less often seen in Bangkok than *H. pileata*, the Black-capped Kingfisher, but has very similar habits, and is usually to be observed perched on overhanging branches or other points of vantage on the banks of our tidal canals or ponds, but I believe its food consists chiefly of fresh-water crustacea and other denizens of the mud-banks.

# 81. *Halcyon pileata* (Bodd.). *The Black-capped Kingfisher.*

*Halcyon pileata*, Blanford, Faun. Brit. India, Birds, iii (1895), p. 133; Gyldenstolpe 1913, p. 55; Robinson, Ibis, 1915, p. 732; id. Journ. F. M. S. Mus., vii (1917), p. 148.

*Halcyon pileatus*, Ogilvie-Grant, Fasc. Malay, Zool., iii (1905), p. 110; Robinson and Kloss, Ibis, 1911, p. 34.



*Description.* Length about 292 mm. (11.5 in.). Crown, nape and sides of head black—a few white feathers below the eye; a broad buffy white collar round the neck, followed by a blackish band behind; scapulars, back, rump, upper tail-coverts, upper surface of tail, outer webs of secondaries and tertiaries above, and greater primary coverts deep blue, brighter on the lower back and rump; remaining wing-coverts black; primary quills black at the ends (the first primaries for half their length, the inner ones for less), with the basal portion white on the inner web, pale bluish lilac on the outer web, opposite the white, and deep blue for a short distance beyond the lilac part; secondary quills deep blue on outer web and a small portion of inner web near the shaft, the remainder of the inner web black. Chin, throat and middle of breast white; sides of throat and breast and remainder of lower surface, with the wing-lining, ferruginous buff; tail black beneath.

In young birds, and in many females, the breast-feathers have dark edges, and there are a few small black spots on the sides of the throat.

Iris dark brown. Bill deep sealing-wax red, dusky at base. Mouth sealing-wax red. Legs dusky red in front, bright sealing-wax red behind and on soles. Claws dark horn-colour.

*Distribution.* So far recorded from all parts of the country except the Eastern and Western, but it must occur there also, as it is found both in French Indo-china (Oustalet) and in Burma, including Tenasserim. Blanford (*op. cit.*, p. 134) remarks that this bird is "seldom found inland," though specimens have been obtained some distance up the rivers in Burma. In Siam it has been procured by Gyldenstolpe several hundred miles from the sea, at Meh Lem, Præ, Northern Siam; and I have also a specimen from the same locality, obtained four years later.

*Habits, &c.* This bird, so far as my observations extend, occurs in Bangkok only from October to March, during which months it is quite common. It probably leaves Bangkok to breed, but there is no information either in the Fauna of British India, or Hume's Nests and Eggs of Indian Birds (2nd. Edition) as to when this occurs, while in the Catalogue of Birds' Eggs in the British Museum (Vol. iii, p. 38), no dates are given for the two clutches recorded from Borneo and China, respectively. Like other Kingfishers, this bird has a straight,



undeviating flight, during which it utters a loud, noisy cry of *cheh, cheh, cheh, cheh, cheh*. It has another note, uttered while sitting—a rather melodious trill of *kr-r-r-r-r* or *chr-r-r-r*.

82. *Saurepatis chloris* (Bodd.). *The White-collared Kingfisher.*

Siamese, นก กินเพียง—Nok kin-pio.

*Saurepatis chloris*, Blanford Faun. Brit. India. Birds, iii (1895), p. 135

*Halcyon humei*, Ogilvie-Grant, Fasc. Malay. Zool., iii (1905), p. 111.

*Halcyon armstrongi*, Robinson and Kloss, Ibis, 1911, p. 34; Robinson Journ. F. M. S. Mus., v, p. 145 (1915).

*Halcyon chloris*, Robinson, Ibis, 1915, p. 731; id. Journ. F. M. S. Mus., vii, p. 149 (1917).

*Halcyon chloris armstrongi*, Gyldenstolpe 1916, p. 117.

*Description.* Length about 241 mm. (9.5 in.). Crown, nape and sides of head to below the eye bluish green—the ear-coverts sometimes black; a white streak above the lores, extending back above the eye; a broad white collar; upper back and scapulars dull bluish green to greenish blue; lower back, rump and upper tail-coverts bright blue; upper surface of tail and of outer webs of wing-feathers deep blue, sometimes with a slight greenish tinge; quills, except on the outer webs, blackish, as is also the lower surface of the tail-feathers; entire under-surface of body, including the wing-lining, white, sometimes faintly tinged with buff.

Iris dark brown. Upper mandible, and tip and edge of lower, dark horn-colour; remainder of lower mandible pinkish white; legs and feet plumbeous to brownish plumbeous. Claws horn-colour.

*Distribution.* This species occurs only in the coastal regions of the country, from Patani in the South-west to the South-eastern limits of Siamese territory, as well as on the Western side of the Malay Peninsula.

As Robinson has shown, there is no justification for the attempts which have been made to divide up this species into various races. The specimens I have examined bear out his contention that the variations on which these races have been founded are individual and not local.

*Habits, &c.* In Bangkok I have observed the White-collared Kingfisher from January to September, and it is exceedingly abundant from March to June, during which time it is very much in evidence.



both on account of its striking appearance and its incessant calling. Its notes appear to be of three different kinds, viz., (1) a loud screaming cry of *ka, ka, ka, ka, ka*, uttered while flying, (2) a regular *cheep, cheep, cheep*, usually uttered four times, but occasionally five, while seated, and (3) a soft, confidential note of *krui-krui*, also when seated, which last appears to be of an amative nature, as I have only noticed it when a pair are together, undisturbed.

It breeds here regularly from February to June, or possibly a little later, and lays four white eggs, either in a tree-ant's nest, or in a hole in a tree.

Family *UPUPIDAE*—*Hoopoes*.

83. *Upupa epops longirostris* Jerdon. *The Burmese Hoopoe*.

Siamese, นกการเวกหัวขาว—Nok kārang hua khwān.

*Upupa indica*, Blanford, Faun. Brit. Ind., Birds, iii (1895), p. 161; Ogilvie-Grant, Fasc. Malay. Zool., iii (1905), p. 108; Robinson and Kloss, Ibis, 1911, p. 35; Robinson, Journ. F. M. S. Mus., v, p. 145 (1915); Gairdner, Journ. N. H. S. Siam, i, p. 150 (1915); Williamson, ibid., p. 198 (1915).

*Upupa epops indica*, Gyldenstolpe 1913, p. 56.

*Upupa epops longirostris*, Gyldenstolpe 1916, p. 111.

*Description.* Length of males up to 330 mm. (13 in.). Crest pale rufous, all the feathers with black tips: sides of head, chin, neck all round, breast and upper portion of abdomen varying from ashy rufous to pale rufous with a vinous tinge—the hind neck being generally darker and more rufous than the other parts: bend of wing (in adults) pale rufous; upper back light brown (sometimes with ashy tinge), then a black band, followed by a buffy white one, this in turn succeeded by a broad brownish black band with imperfect whitish or buffy bars; rump white; upper tail-coverts white at base, black at ends: tail black with a white bar across it halfway down; primary and secondary quills black, the first primary generally, but not always, with a white spot on the inner web, the other primaries with a white band across them, imperfect on the innermost three or four, and the secondaries with white bases and four white bands: tertiaries dark brown, edged with buffy white and with an oblique band of the same colour on the inner web. Lower portion of abdomen and under tail-coverts white.



Iris reddish brown to dark brown. Bill dark brown, pale to pinkish horn-colour at gape and at base of lower mandible. Mouth pinkish flesh. Legs purplish brown to plumbeous, soles greyish white. Claws dark horn-colour.

*Distribution.* Recorded, by the authors quoted in the synonymy, from all parts of the country except the Central and South-eastern divisions where, however, I have obtained it.

In Bangkok this is a rare bird and I believe only seen in the cold season. The first of my two Bangkok specimens was caught in the room of a house on the west bank of the river on the 26th January 1915, while the second was shot in the neighbourhood of Sathorn Road on the 16th January 1917. Both are fully adult birds. As a rule they are found here singly, but I once saw a pair on Race-course Road, and another pair was observed some years ago by Dr. Malcolm Smith in a compound in Suriwongse Road.

The Burmese race of the Hoopoe (to which also the Siamese bird belongs) has been separated from the Indian form mainly on account of its larger size, including the bill which, in typical male specimens, measures 66 mm. (2.6 in.) in length, or more. A male in my collection from Rayong, South-eastern Siam, has a wing of 155 mm. (6.1 in.) and a bill of 65 mm., while another male, from Nong-kae, South-western Siam, has a bill of 68 mm., but with a comparatively short wing of 140 mm.

*Habits, &c.* Hoopoes are generally found in fairly open wooded country, such as mixed scrub and bamboo, though I have observed them in heavy evergreen forest at Nong Khor, near Sriracha, in South-eastern Siam. They feed on the ground on insects, and are said by Blanford to extract grubs with their long bills from some distance beneath the surface. I have found them very common in some parts of the country, such as in the coastal region of the South-west.

(To be continued.)



## PRELIMINARY DIAGNOSES OF FOUR NEW SEA SNAKES.

BY MALCOLM A. SMITH, M.R.C.S., F.Z.S.

***Hydrophis lamberti.***

Posterior maxillary teeth, 10. Head moderate, body moderately elongate. Eye longer than its distance from the mouth, rostral broader than deep, frontal shorter than its distance from the rostral; one prae- and two postoculars; two superposed anterior temporals followed by ordinary scales; 8 supralabials, third and fourth touching the eye. No distinct posterior chin-shields.

35 scales round the neck, 45 round the body, anteriorly imbricate, posteriorly hexagonal and more or less juxtaposed, with a central tubercle or short keel. Ventrals distinct throughout, 281-302.

Yellowish grey above, yellowish white below, with 33 to 38 dark dorsal rhombs. Head yellowish olive.

Total length, 860; tail 80 mm.

Habitat, Gulf of Siam. Type locality, mouth of the Meklong River.

Closely allied to *H. ornatus* Gray, from which it differs chiefly in the smaller number of scales round the body.

***Hydrophis rostralis.***

Posterior maxillary teeth, 5. Head small, body long and slender anteriorly, snout long. Rostral as broad as deep, the portion visible above equal to three-quarters or the whole length of the internasal suture. Frontal shorter than its distance from the rostral, one prae- and one postocular; one large anterior temporal, succeeded by another as large. 6 supralabials, third and fourth touching the eye. Chin-shields subequal, the posterior pair in contact.

20 to 23 scales round the neck, 35 to 41 round the thickest part of the body, anteriorly elongate and imbricate, posteriorly hexagonal and more or less juxtaposed, the keels most strongly marked posteriorly, and usually broken up into several tubercles. Ventrals feebly enlarged, single anteriorly, completely divided by a median furrow posteriorly, 272 to 302.



Pale bluish grey above, yellowish or whitish below, the young with indistinct dark dorsal bars or complete bands. Head grey, yellowing with age.

Total length, 1025 ; tail 95 mm.

Habitat. Coast of Perak. Type locality, Kuala Larut. Allied to *H. gracilis* (Shaw) and *H. cantoris* Gunther.

### ***Hydrophis consobrinus.***

Posterior maxillary teeth, 5. Head very small, body very long and slender anteriorly. Eye slightly greater than its distance from the mouth ; rostral broader than deep, frontal equal to or less than its distance to the rostral. One prae- and one or two postoculars. One large anterior temporal, followed by another not so large. 6 or 7 supralabials, third and fourth touching the eye. Chin-shields subequal, the posterior pair in contact or partly separated by a scale.

25 to 31 scales round the neck, 36 to 45 round the thickest part of the body, anteriorly elongate and imbricate, posteriorly hexagonal and subimbricate or more or less juxtaposed, with a central tubercle or short keel. Ventrals distinct throughout, 328 to 401.

Grey above, yellowish white below, with 60 to 80 dark grey bands or annuli. Head greyish olive, with a curved yellow mark along the sides of the head and across the snout.

Total length, 1035 ; tail 115 mm.

Habitat. Gulf of Siam and Coast of Perak. Type from the mouth of the Bangpakong river, Siam.

Allied to *H. fasciatus* (Schneider) from which it differs in the lower average number of scales round the body, in the lower average number of ventrals, in the size of the frontal, in the small scales behind the parietal shields, and in colouration.

### ***Hydrophis siamensis.***

Posterior maxillary teeth, 8 or 9. Head moderate, body moderately elongate ; eye equal to or a little larger than its distance from the mouth ; rostral distinctly broader than deep ; frontal as long as or shorter than its distance from the rostral ; one prae- and one (rarely two) postoculars : usually a single anterior temporal ; 7 or 8 supralabials, third and fourth (rarely fifth) touching the eye. Chin-shields subequal, the posterior pair in contact or partly separated by a scale.



29 to 35 scales round the neck, 35 to 42 round the thickest part of the body, imbricate anteriorly, hexagonal and subimbricate posteriorly, with a central tubercle or short keel. Ventrals distinct throughout. 271 to 343.

Greyish or greenish-grey above, greenish or yellowish white below, with 55 to 68 dark grey annuli. Head greyish or blackish with yellow markings along the side of the head and across the snout.

Total length, 1000 ; tail 125 mm.

*Habitat.* Gulf of Siam. Type locality, mouth of the Chantabun river.

Nearest perhaps to *H. cyanocinctus* Daudin, but differing in the much smaller size, smaller frontal shield, larger eye, single anterior temporal, and in colouration.



ON THE ALLOCATION OF THE NAME *SCIURUS FINLAYSONI*.  
HORSFIELD.

By OLDFIELD THOMAS, British Museum.

(Published by permission of the Trustees of the British Museum),

A controversy has recently arisen between Messrs. Robinson and Kloss as to the respective names of the white squirrels of the Siam Mainland and of Si-chang Island in the Gulf of Siam, and since I have access to what seems the essential piece of evidence in the matter—Horsfield's type—I may venture to express an opinion on the subject.

The three recent notes on the subject are as follows:—

- (1). Kloss, C. B. Journ. Nat. Hist. Soc. Siam, i, p. 157, 1915. Discovery of difference between mainland and island forms. Original *finlaysoni* applied to mainland one, and *portus* given to that of the island.
- (2). Robinson, H. C. Journ. Fed. States Museum, vii, p. 35, 1916. Statement that Kloss was wrong in assigning *finlaysoni* to the mainland squirrel, since it is shown by Wroughton's descriptions of "the type" that it is the smaller, island form. The latter therefore is true *finlaysoni* and the name *tachardi* is given to the mainland one.
- (3). Kloss, C. B. Journ. Nat. Hist. Soc. Siam, ii, p. 179, 1916. Reiteration of previous opinion, partly on the ground that Horsfield had in his mind the mainland form and quoted Buffon's *Ecureuil blanc de Siam*, and partly that Anderson quoted "Siam" as the locality of the type of *finlaysoni* and might be considered a "first reviser" in the matter.

In discussing what Horsfield "had in his mind" and similar lines of argument, Mr. Kloss appears to me to have overlooked the advisability of making inquiry as to what types exist, bearing on the question.

Far from giving the name primarily to Buffon's White Squirrel



Horsfield, after describing the species from Finlayson's notes, definitely places, in accordance with the custom of his time, the words "Museum of the East India Company" as the collection in which the original of his name was preserved.

Later on, in his Catalogue of that very Museum, we have :—

*"Sciurus finlaysoni",* Horsfield.

Hab. Siam.

A. From G. Finlayson's Collection."

No one accustomed to dealing with the older collections would refuse to admit that this specimen A, the only one in the Museum said originally to contain the animal described, should be regarded as the type. The word "Siam," whether used by Horsfield or Anderson would of course, as pointed out by Robinson, have been of general application, and would have included a little coastal island like Si-chang.

The British Museum now contains both this type specimen, received with the India Museum Collections in 1879, and one from Si-chang given by the East India Company about 1830, which was also obtained by Finlayson, and referred to by Anderson. The former's Museum number is 79.11.21.521., and the latter's, 71a.

Supposing these specimens to represent the two quite distinct forms concerned, both Robinson and Kloss estimate very lightly Anderson's statement that "these two specimens are exactly alike", and give reasons explaining how he might have come to such a conclusion.

But in this case Anderson is absolutely right. They *are* exactly alike, being both referable to the small island squirrel, and not to that of the mainland.

That the specimen he called the type belonged to the insular form was of course evident from Wroughton's measurements of its skull, but that it was *rightly* called the type I claim firstly from Horsfield's "Museum of the East India Company" following the description, this specimen being then and always the only example there preserved, and secondly, if that is not considered sufficient, and Anderson is called in as a first reviser, then his words "The type of *S.*



*finlaysoni*".....referring, as is evident from the context, to this specimen (for the other is quoted separately), would of themselves fix it as the type.

Since, as stated above, this type is the small island form, that will stand as *Callosciurus finlaysoni finlaysoni*, with *portus* as a synonym, while the mainland squirrel will bear Robinson's appropriate name of *tachardi*, the type of the latter, so designated by its author, being B. M. No. 0.10.7.7.

Mr. Robinson's conclusion, therefore, is in my opinion fully justified, as opposed to that come to by Mr. Kloss.

Finally as a small point I should like to demur to Mr. Robinson's use of the word "co-types" (in paper (2), p. 36), for specimens which do not form part of the series on which the name concerned was originally founded. Definitions of the words "co-type," "paratype," and "metatype" (which last Mr. Robinson's specimens might possibly be considered to be), will be found in P. Z. S., 1893, p. 242.

[I doubt whether Horsfield recognised any particular specimen as the type: it is rather a case of what part of the material he referred to and the question is not so much what existed in 1824.

Contrary to Thomas' statement ("then and always the only example there preserved") this material consisted at that time of two or more specimens since one was transferred to the British Museum about 1830 (No. 74 a) and another in 1879 (No. 79. 11. 21. 521). Horsfield's Catalogue, compiled in 1851, obviously does not record all the specimens that the East India Company formerly possessed. Thus there is no indication of any particular type and I do not think because only one example was subsequently retained that we have, of necessity, any right to consider it as such.

No. 74. a. came from Koh Si-chang (*vide* Thomas) and was so localised by Anderson, and since only two specimens now appear to have been in question in his time, the other (No. 79. etc., A of Horsfield's Catalogue) may perhaps be that regarded by him as the type, with the statement that it came from Siam: nowhere does it seem to be definitely said that it came from Koh Si-chang as is the case with



the former, and Thomas himself only infers this on account of both being of similar size.

The view held by Robinson and Thomas, contrary to mine, that "Siam" was used by Horsfield and Anderson as a term of general application does not seem to me warranted, since Finlayson and Anderson both go out of their way to state deliberately that only one of the specimens came from the island: the obvious inference being that the remaining material was obtained elsewhere. Anderson's statements certainly cannot be explained away in the above fashion.

I did not, as suggested, overlook the matter of the material now existing, but, accepting Anderson's statement that a specimen came from Siam proper, considered that it might have since disappeared—no isolated occurrence. Thomas shows that only two white squirrels from Finlayson's collection are in the British Museum to-day and though Anderson says he examined other specimens from Siam, they might not have been of the typical series or he may have seen them elsewhere, while the two he refers to specially were probably those mentioned above: thus the question may perhaps be limited to whence came the example not specifically recorded as from Koh Si-chang (No. 79, etc.). It is, says Thomas, the specimen of which Wroughton has given measurements (with the statement that it is fully adult), so the arguments now put forward certainly point to Koh Si-chang as the type locality—if we are to believe that Finlayson only obtained these two specimens, in spite of what Anderson says and Horsfield indicates.

Mr. Thomas reflects on Mr. Robinson's use of the word "co-type" but he himself is equally at fault. There is no type of *finlaysoni*: the only specimen specifically mentioned, even indirectly, by Horsfield is Rutherford's animal from Koh Si-chang which Mr. Thomas does not accept as the type: in strict accuracy, therefore, any specimen of the original series subsequently selected can only be a lecto-type<sup>3</sup>. The other specimens referred to by Mr. Robinson as co-types of his *tachardi* would be idiotypes\* since they are not of the original series (Mr. Lyle's). C. Boden Kloss].

<sup>3</sup>Ann. and Mag. Nat. Hist. (7) xvi., p. 102 (1905).



## PROCEEDINGS OF THE SOCIETY.

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### 2ND ORDINARY GENERAL MEETING, 1917.

Held at the Office of the Bangkok Times on July 3rd, 1917.  
There were present 13 members and 4 guests.

After the usual business the following exhibitions were given:—  
By H. R. H. the Prince of Chumpon, specimens of birds, mammals and shells recently collected by him in S. E. Siam. By Dr. Malcolm Smith, examples of the poisonous terrestrial snakes found in this country. By Mr. W. J. F. Williamson, a series of birds, with their nests and eggs, chiefly from the neighbourhood of Bangkok. By Mrs. Lyle, specimens of hares collected in the neighbourhood of Chiangmai.

### 3RD ORDINARY GENERAL MEETING.

Held at the Office of the Bangkok Times on November 25th, 1917. Present, 17 members and 7 guests.

Messrs. Williamson and Smith, exhibited specimens of the mammals, birds, reptiles and insects, recently obtained by their collectors in the North of Siam. An interesting exhibit of butterflies was also given by Mr. E. J. Godfrey; and specimens of the Siamese Porcupine and Scaly Ant-eater were shown by Mr. J. J. MacBeth.







# STATEMENT OF ACCOUNTS FOR 1917.

RECEIPTS		EXPENDITURE	
	Ticals.		Ticals.
Balance from 1916 ...	381.01	Production of Journal	
Subscriptions ...	1,231.91	On a/c of Vol, II. No. 2	36.36
Journals sold ...	116.16	„ a/c „ Vol, II. No. 3	573.15
Interest on balance at Bank ..	5.64	„ a/c „ Vol, II. No. 4	412.66
			—1,022.17
		Postage ...	80.22
		Printing and Binding ...	55.76
		Stationery ...	15.50
		Hire of room for General Meetings ...	15.00
		Purchases for Library ...	31.64
		Amount on deposit with Messrs. Thacker Spink & Co., Calcutta ...	25.00
		Balance at Bank ...	489.43
Tcs.	<u>1,734.72</u>	Tcs.	<u>1,734.72</u>

Bangkok,

20th January, 1918.

(Sd.) S. H. COLE,

*Hon. Secretary and Treasurer*



LIST OF MEMBERS ON 31ST DECEMBER, 1917.

Aagaard, C. J.	Laydeker, E. A.
Anusasana Panichkarn, Luang	Lloyd, Mrs. W. F.
Ayer, Dr. Ira	Lucius, Dr. med. R.
Bain, W.	Lyle, Mrs. T. H.
Barron, P.A.R.	Macleod, G. G.
Bonnafous, H.	Massey, H. E.
Braham, N. C.	McBeth, J. J.
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Cable, J. A.	Nunn, W.
Cambiaso, Count F.	Nystrom, F.
Carthew, Dr. M., M.D., D.P.H.	Ogilvie, A. W.
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Collins, Mrs. D. J.	Phongse Sanitwongse, Mom Luang
Due-Petersen, Dr.	Porter, A. A.
Eisenhofer, E.	Queripel, A. L.
Elwes, G. F. W.	Robert, Dr. L.
Eyton, S. W.	Rogers, B. H.
Follett, C. B.	Ross, D.
Forty, C. H.	Sherriff, C. A.
Gairdner, K. G., C.M.Z.S.	Slack, T. A.
Gayetti, Dr. C.	Smith, E. Wyon
Geyer, H.	Smith, M.A., M.R.C.S., L.R.C.P., F.Z.S.
Godfrey, E. J., B.Sc., F.E.S.	Smyth, G. C.
Graham, H.	Spencer, F. D.
Groundwater, C. L.	Spigno, A. B.
Groves, Mrs. S. P.	Sprater, Major W.
Grut, W. L.	Seub Suk Sawat, Mom Chao
Hall, R. G.	Trotter, E. W.
Healey, E.	Walsh, H. C.
Herbert, E. G., C.M.Z.S.	Ward, T. R. J., C.I.E., M.V.O.
Irwin, A. J., B.A., B.A.L., A.M.I.C.E., F.R.G.S.	Webb, G. E., B.A.
Joynson, H. W.	Weeks, W. G.
Keynes, S. C.	Weston, C. M.
Lambert, S. G.	Williamson, W.J.F., F.Z.S., M.B.O.U.
	Wolf, G.
	Yates, H. C. St. J.

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H.R.H. The Prince of Chumporn.

Baker, E. C. Stuart, F.Z.S., M.B.O.U.      Gyldenstolpe, Count Nils, B.A.

Kloss, C. Boden, F.R.G.S., F.Z.S., M.B.O.U.

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**MAMMALS.**

Diagnoses of new Mammals from the Trengganu Archipelago, East Coast of the Malay Peninsula. By C. Boden Kloss. (Annals and Magazine of Natural History, Ser. 8, Vol. vii, January 1911, pp. 115-119).

On new Mammals, mainly from Bandon and the adjacent Islands, East Coast of the Malay Peninsula. By Herbert C. Robinson, C.M.Z.S., and C. Boden Kloss, F.Z.S. (Annals and Magazine of Natural History, Ser. 8, Vol. xiii, February 1914, pp. 221-234).

On a Collection of Mammals from the Coast and Islands of South-East Siam. By C. Boden Kloss, F.Z.S., F.R.G.S. With an Account of the Fruit-Bats, by Dr. Kund Andersen, F.Z.S. (Proceedings of the Zoological Society of London, 1916, pp. 27-75).

Notes on the type specimens of some Burmese and Himalayan Rats. By C. Boden Kloss. (Records of the Indian Museum, Vol. xiii, Part I, No. 2, 1917, pp. 5-10).

**BIRDS.**

How to know the Indian Waders. By Frank Finn, B.A., F.Z.S., M.B.O.U. (1906).

The Waterfowl of India and Asia. By Frank Finn, B.A., F.Z.S., M.B.O.U. (1909).

The Game Birds of India and Asia. By Frank Finn, B.A., F.Z.S. (1911).

**REPTILES AND BATRACHIANS.**

Catalogue of the Batrachia, Salientia and Apoda (Frogs, Toads and Coecilians) of Southern India. By Edgar Thurston. (1888).

**FISHES.**

The Sea Fisheries of Malabar and South Canara. By Edgar Thurston. (Bulletin, Vol. iii, No. 2, Madras Government Museum, 1900).

Annual Report of the Department of Fisheries, Bengal, Bihar and Orissa, for the year ending 30th June, 1917.



**PUBLICATIONS IN LIBRARY OF SOCIETY.**

- The Fishes of the Indo-Australian Archipelago. Vol. iii. (1916).  
By Dr. Max Weber and Dr. L. F. de Beaufort.  
Marine Aquarium, Madras. Guide to the, (1913).  
The Fauna of British India. Fishes (2 vols.). By Francis Day,  
C.I.E., LL.D. (1889).

**INSECTS, ETC.**

- Mosquitoes and their relation to disease. Their life-history,  
habits and control. (Pamphlet). By F. W. Edwards, B.A.  
(1916).  
The Bed-bug. Its habits and life-history and how to deal with  
it. (Pamphlet). By Bruce F. Cummings. (1917).  
Species of Arachnida and Myriopoda (Scorpions, Spiders, Mites,  
Ticks and Centipedes) injurious to man. (Pamphlet). By  
Stanley Hirst. (1917).

**BOTANY.**

- Catalogue of Wood Specimens exhibited in the Economic Section  
of the Government Museum, Madras. (1916).  
Keys to the Ferns of Borneo. By Edwin Bingham Copeland.  
(The Sarawak Museum Journal, Vol. ii (Part. iii), No. 7,  
1917).

**GENERAL.**

- Rámésvaram Island and Fauna of the Gulf of Manaar. By  
Edgar Thurston, C.M.Z.S. (Bulletin No. 3, Madras Government  
Museum, 1895).  
Guide to the Zoological collections of the Raffles Museum, Singa-  
pore. By R. Hanitsch, Ph. D. (1908).  
The Biology of Waterworks. (Pamphlet). By R. Kirkpatrick.  
(1917).  
Fauna of the Chilka Lake. Sponges, Polyzoa, Cirripedia,  
Coelenterata. By N. Annandale. Echiuroidea, Ctenophora.  
By N. Annandale and Stanley Kemp. (Memoirs of the Indian  
Museum, Vol. v, 1915.)

**JOURNALS, PROCEEDINGS, ETC.**

- Annals and Magazine of Natural History. Eighth Series. Vols.  
xvii and xviii. (1916). Vols. xix and xx. (1917).  
Bulletin du Jardin Botanique. Nos. xxii and xxiii. (1916). Nos  
xxiv and xxv. (1917).  
Journal of the Federated Malay States Museums. Vol. vii. (1916-  
1917).  
Mededeelingen van het Laboratorium voor Plantenziekten. Nos.  
19-27. (1916). Nos. 28-30. (1917).  
Proceedings of the United States National Museum. Fifty-six  
Papers on various subjects. 1906, 1908, 1909 and 1917.



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Records of the Indian Museum. Vol. viii. Part iv. (1914). Vol. xii. (1916). Vol. xiii. (In issue).

Reports of the Government Museum, Madras, for 1915-1916 and 1916-1917.

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Spolia Zeylanica, Vol. x, Parts 37-39. (1915-1917).

The Journal of the Bombay Natural History Society. Vol. xxiv. (1915-1917). Vol. xxv. (In issue)

The Journal of the Natural History Society of Siam. Vol. i. (1914-1916).

The Philippine Journal of Science. Vol. x, Sec. D. (1915). Vol. xi, Sec. D. (1916). Vol. xii, Sec. D. (1917).

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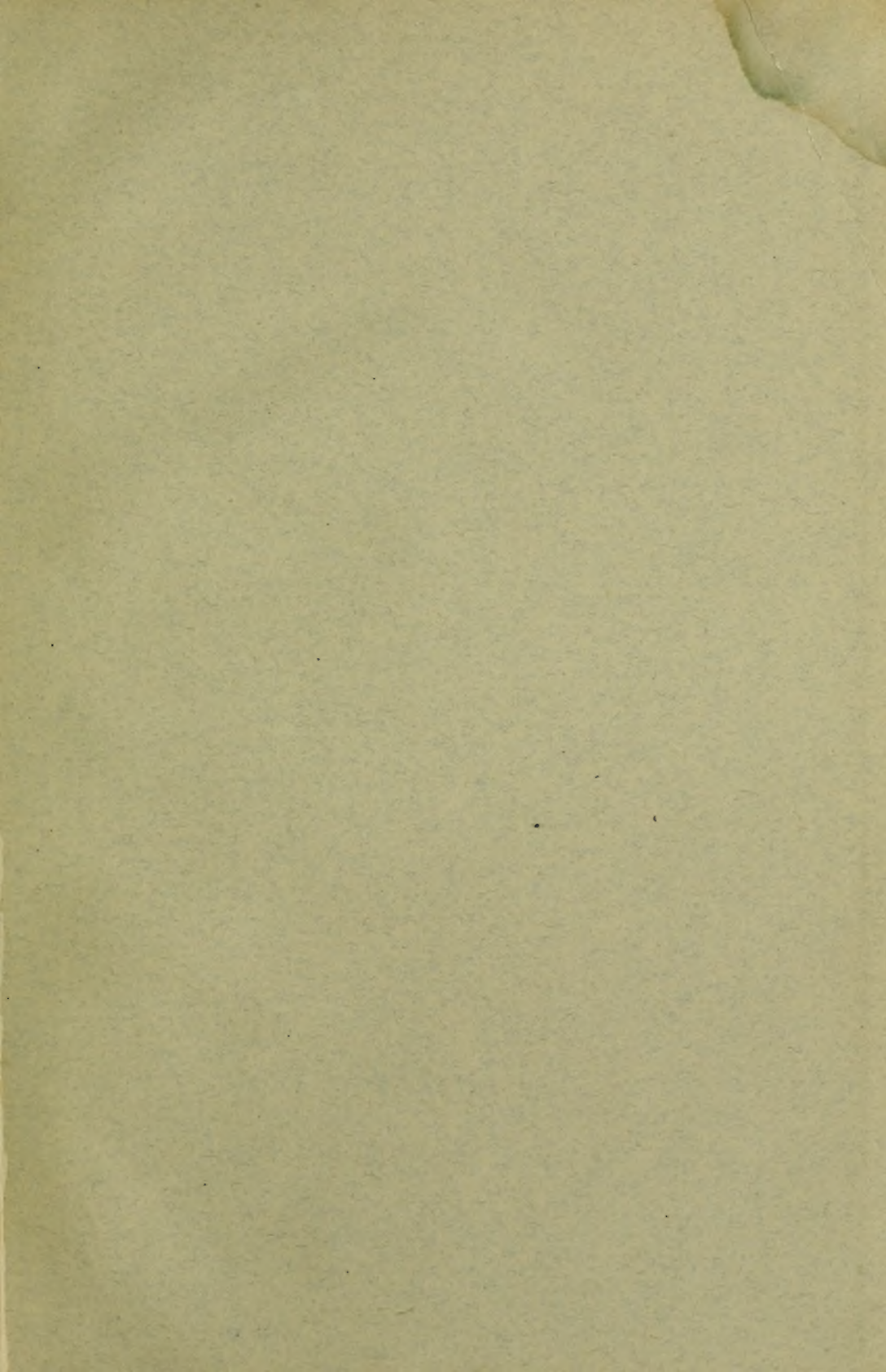




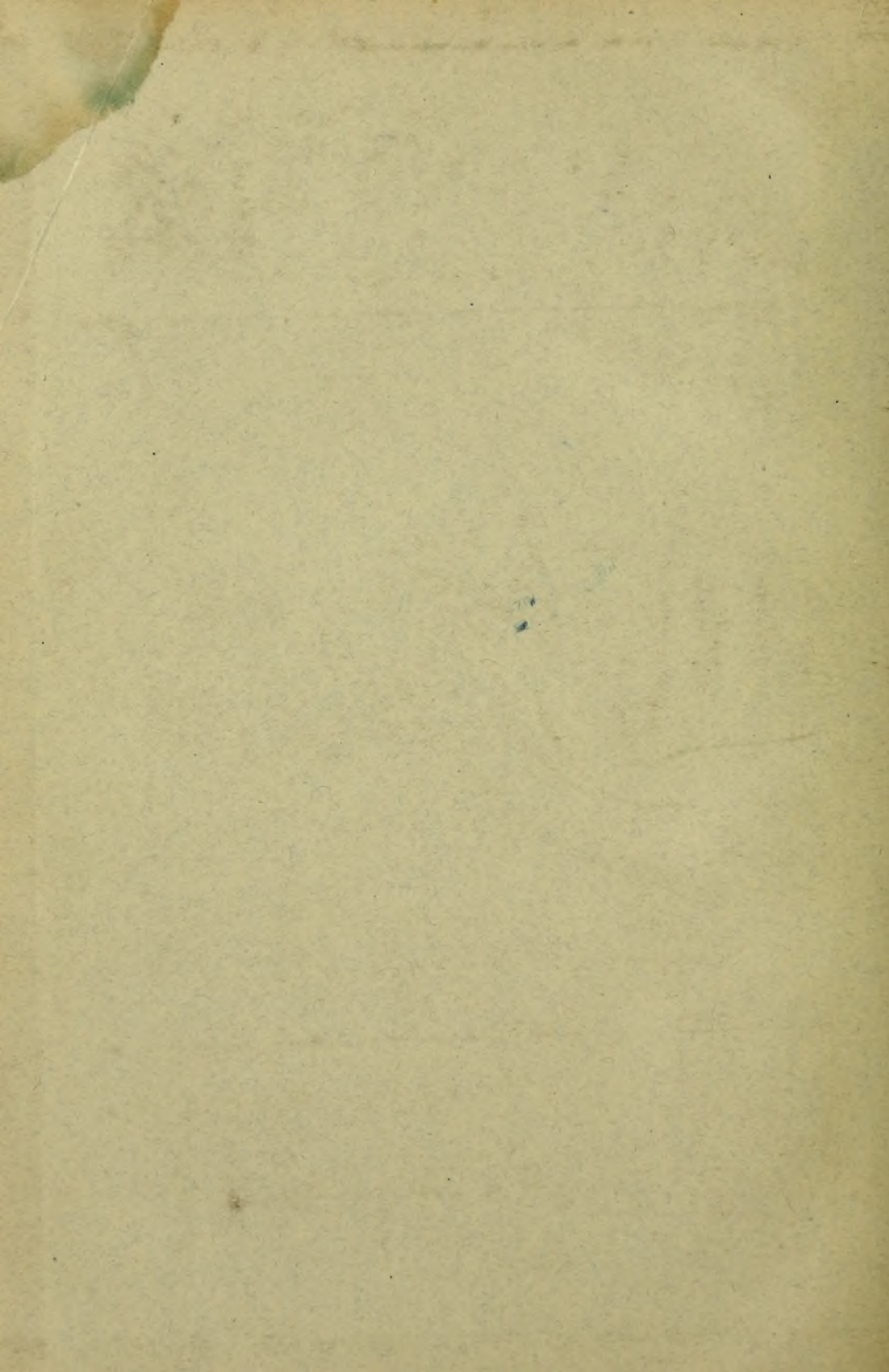














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